EXHIBIT H-1

AMERICAN ARBITRATION ASSOCIATION

INTERNATIONAL CENTRE FOR DISPUTE RESOLUTION

COMMERCIAL ARBITRATION RULES

BOSCH AUTOMOTIVE SERVICE
SOLUTIONS, INC.,

Claimant,

vs. Case No. 01-21-0016-2306

Arbitrator Thomas W. Cranmer

COLLISION SCIENCES, INC.,

Respondent.

ARBITRATION HEARING

Taken at 150 W. Jefferson Avenue, #2500,
Detroit, Michigan
Commencing at 9:10 a.m.,
Monday, September 9, 2024,
Before Jenifer Weisman, CSR-6006.

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(Exhibits attached to the transcript.)

agreement with Chrysler, and we released the product shortly thereafter, like 2008.

And then in 2010, we started -- we had landed an agreement with Honda; again, to support all of their vehicles from 2012 and newer so they can meet this requirement. And then Toyota, the same way, as well as Mazda and Nissan. And these are all agreements that in exchange for the license agreement, that we can sell the tool and make enough money on the tool to pay for the development and its continued development, and we'll go over that later. But this is our commitment to the OEMs; that we would do it at no charge in exchange for the license agreement.

And so Suzuki, we also engaged Suzuki, as well as BMW and Volvo and Daimler, and then the other German OEMs kind of followed after that.

So we basically covered about 98 percent of the vehicles sold in the U.S. with our CDR tool, and one of the benefits was that, you know, it's the same use case, the same functionality for all OEMs, same reports, very similar reports so that the users don't have to relearn how to use a tool for the next OEM.

BY MR. ZELLER:

Q. Exhibit 6, page 2 says now 17-plus OEMs supported. That's what it was in October of 2019, right?

A. Yes.
Q. Is that -- what is the number now?
A. I think it's 25 or 26. The challenge with that is Stellantis bought a bunch of companies, so that technically can be one OEM, but they bought a lot of brands like Citroen and Peugeot and Chrysler, and such --
Q. Yes.
A. -- and Fiat. It's about 26 OEMs and climbing.
Q. So why don't we talk about what the tool is. Go to the next page.
A. Okay. So briefly, the term CDR was coined by the CEO of Vetronix, crash data retrieval, and it's not a tool that -- it doesn't go in the vehicle; it's not a device that goes in. It basically connects to the vehicle to retrieve data that's stored in their airbag control modules that is considered crash data, or now they call it event data recorder, EDR data. It's used to retrieve, again, data that's stored in the vehicle and consists of a PC application, personal computer application, a Windows app.

Vehicle interface module, so the interface module contains various protocols that it communicates with -- it's able to communicate to vehicles; very specific technology, so there's a lot of protocols

that it supports. And then the idea here, and we can talk about this later, the vehicle connects through the vehicle's OBD port. So we have an OBD connection to the actual vehicle, as well as the OEMs needed -- because crashes aren't real nice and neat, so a lot of times they lose power during a crash and so we had to create a cable for every airbag control module that the OEMs support. This was part of the agreement. We were going to create the software, the hardware, and the necessary cables to do the complete download. If the car was crashed, then we had to connect directly to the module. If you can imagine, there's a lot of vehicles out there with a lot of cables. So we create cables that our customers purchase. And there's -- then there's potential adapters that as you get into communicating with vehicles, there's different protocols and stuff that we have to support that aren't supported typically on a diagnostic tool.

Q. That's a great segue. There's a reference there to not being a diagnostic scan tool. What is a diagnostic scan tool and what's the difference?

A. Well, a diagnostic scan tool is used by technicians to troubleshoot vehicles. If there is -- if a vehicle triggers a trouble code, they use that to see what the trouble code is and what the OEM says is wrong with

the vehicle, as well as to look at data in real time while they're doing the diagnosis. You know, that's a pretty standard tool since like the late '80s.

This is not a scan tool, because its purpose was designed to retrieve crash data specifically. Now, it uses a lot of the scan tool capabilities like the protocols that are built in to support our other diagnostic tool needs, but we -- there is a use case where we have to create a piece of hardware that allows it to connect directly to a module, and without getting into a lot of details, that's a little problematic because there's an inrush of current when you charge -- when you connect to an airbag module, so the point is it's specific to crash data retrieval.

Q. So the next page, can you tell us what the tool actually does?

A. So it basically connects to the vehicle to retrieve crash data, and it's not like a data logger like a black box in an airplane, because that records everything all the time; whereas, the EDR data is -- starts recording based on the deployment of any passive restraint device, like an airbag module or a pretensioner. So the data will start recording if anything is deployed. The system says to deploy an

airbag or pretensioner; it will record -- it will take five seconds of data prior to the crash and then information at the crash, and up to 300 milliseconds after the crash, and stores that in the data. So that's what the CDR tool basically was originally designed to do.

However, the OEMs have other data, like Ford stored data in their powertrain control module, the engine control module, so we connected to their -- Ford's powertrain control modules and retrieved data from them, as well as roll-over sensors from GM. So the OEMs would give us their specs and, again, we did it in exchange for an agreement to sell the tool.

The whole idea in the business case is that we're getting enough revenue on the sales of the tool to pay for the development. Then also protection, protection modules and there's new modules, active safety control modules, camera modules, ADAS modules, antonymous driving --

Q. That's a good segue into the next page, which is the data. I think you covered most of it of what's -- what's retrieved is by the tool, right?

A. Yes. So again, it retrieves the data that's stored in the EDR on the airbag control modules. So this was the original use case for the tool, was to retrieve

the EDR data, as well as the OEM said, hey, we've got these active safety modules for automatic emergency braking systems and other things that actually record crash data also, but it also records data that's not just crash data but of certain events. So we work with the OEMs to support many of the modules for GM, their active safety modules; those aren't considered in the traditional sense of EDR, but they are event-based, if, you know, there's emergency braking or whatever, it will record data. And the CDR tool would be used by an accident reconstructionist to go and retrieve active safety data as well as the airbag control module data.

And then the ADAS data, that's obviously the autonomous driving vehicles. They have various levels. A level 4 being the most autonomous. And we've been asked, and are continuously asked, to support the readout of ADAS data. And so that's the kind of the data we retrieve and translate into a report and display it to our customers.

Q. We talked a little bit about the regulations, and go to the next page and tell me what this is and what the different columns are?

A. Okay. So the different columns are examples of the data that's stored. So for the NHTSA requirement,

CFR49563 --

Q. Sorry, go back to the requirement. I know that you said before that NHTSA came out with rule making. Can you explain a little bit more about what the requirement is and who has directed that?

A. Okay. So the regulation is directed to any vehicles built and sold in -- sold, not built, that are sold into the U.S. market, and it requires them to -- if any of the vehicles store any crash data, and they define crash data like prior to an event, if there's any of those data elements stored, the OEM is required to store -- to basically provide a commercially available tool to where the first column defines the minimum data set that those vehicles need to support within 90 days of the vehicle being released to the market.

The second column is the if recorded column. So if that data, for example, roll-over data, if that's recorded, then they have to display it. If it's not recorded, the OEMs aren't mandatory -- mandated to support roll-over data, for example. But if they do store it, so steering angle and engine RPM and such, then they have to report it in the commercially available tool.

The third column is where -- it's just an

example of additional data elements that the OEMs ask us to support, and the OEMs also use it for their internal investigations, so they wanted to add additional data elements to the CDR report when we retrieve crash data, and they decide, you know, which additional data elements -- that's also a big discussion with the OEMs. And so a lot of times we, you know -- the first column is probably one page of the report or two pages of the report. We have up to, you know, 160, 200-page reports on lot of these OEMs as far as the data they wanted reported.

In the green circle -- the square, that indicates the pre-crash data; that's data that's stored up to five seconds prior to the deployment of the device. So it will report vehicle speed, engine throttle and such, as well as, if it's reported, steering input, and that would be pretty valuable information to an accident reconstruction, as well as the OEMs, if they're litigating any product issues or what have you.

Q. Just so I fully understand, the first column is if any of that is recorded, all of it has to be reported --

A. Yes.

Q. -- right?

A. Yes.

Q. And it is on the OEM to make sure that there's a tool that can do that --
A. Yes.
Q. -- right?
A. Yes. Hence, the license agreement and have them choose a supplier to support their need to meet this regulation.
Q. You mentioned active safety and if you go to the next page, you can tell us what the different types of data for active safety is being recorded.
A. So unlike the CDR -- or the EDR data, this actually triggers -- the event is triggered by a potential event where the ECU has to respond to a forward collision mitigation or emergency braking, and that's the trigger for the event. And the active safety module that controls all this -- the main controller for all these functions also stores data such as this in a format that's a time-series-based format, and they'll store some number of times before the trigger and after for this type of data, so vehicle odometer, GPS lat/long, vehicle speed, yaw rate. I mean, so this is just some of the parameters. Since 2019, it's definitely probably tripled in size as far as what we support.
Q. So just so I understand, some of these items might

occur without a crash --
A. Yes.
Q. -- is that what you're saying?
A. Yes.
Q. For example, autonomous braking -- automatic --
A. Emergency braking, yes; forward collision, lane keeping assist, those kind of things.
Q. Has the new -- or as additional data comes on, has it changed Bosch's relationship via contracts with the OEMs?
A. Currently not. In exchange for the agreement, we don't charge them any additional fee to add support to additional modules; that's all on Bosch; develop testing, interfacing to the OEMs, helping them with specs.
Q. And the reports that you're doing with vehicles with the active safety, they're not limited to who they go to, is that correct?
A. No, they're not. Basically whoever buys the CDR tool kit and pays the annual software subscription, they get any new content that's added every year, any new ECU coverage, any new data elements, any changes; that gets passed along to our customers.
Q. I want to ask you to go through the relationship with OEMs and how you built the tool.

A. Okay.
Q. And you can use the next page as a help as you go through that.
A. Okay. So we've got 25 or over brands that we support. Actually, more brands than that obviously; the OEMs. It's kind of a complicated relationship because the OEMs are trying to meet a regulation in order to support this. Also, the OEMs, in a lot of cases, they want to add additional ability for accident investigators to do their own investigation rather than pulling the OEM involved in terms of any kind of litigation.

So the OEMs come to us and the ones that we work with today, they provide us a specification and we review that spec and provide feedback to them, and they refine the spec and then they hand it over to our engineering development team. Our engineering development team basically implements that specification in the CDR tool. And the idea is to kind of keep it common across other OEMs so that the reports and use cases are the same.

So we get a spec and we review it, and then we hand it off to the development team. And during the development time, a lot of times these are new systems and they're not very mature, so there's a lot

of back and forth with Bosch and the OEMs to refine the specifications so that the OEM is happy with what they see and the OEM will basically review what we implement, and they will tell us whether it meets the requirements or not, and then the Bosch team, once the OEM is satisfied with an implementation -- and this is for every ECU we support -- then we go in and we will -- our test team will test the spec and they will test all the possible values, you know; they formulate values, the enumerated values. So in other words, you'd have a data element that may have 20 different -- 30 different possible developments based on the data that's returned, and our team tests all that.

The OEM will test, they'll do spot-checking just to make sure it meets the requirements, but they trust Bosch, because Bosch is a 9001 -- ISO-9001 certified in term of, you know, meeting requirements for ISO certification, you know, anything from getting requirements from the OEMs, doing testing and stuff. So the OEMs -- and that's part of our agreement too, a lot of the OEMs require an ISO certification.

So our team will go and test before we release the software. So the OEMs, we send them test versions, and they do their own internal testing, and

a lot of times the specs are changed, you know, during this whole development process. They say oh, yeah, we made a mistake, this -- whatever. So we'll make the changes, implement it, test it, and send it back to the OEMs. This is kind of an iterative process. A lot of times they have to send us ECUs so we can confirm the implementation, and then our test team basically goes and tests all the aspects of the software; every data element, every value, every formula, and then we release it to the field.

Q. Can we talk about the timeframe that it takes to do the process that you were just talking about in going back and forth?

A. Well, it depends on, one, whether or not we support an OEM that's asking us to implement the solution. If it's an existing OEM and it's based -- we already have a relationship on how to deal with and how to distribute software and address bugs and all that kind of stuff, that probably takes -- a new system may take three to four months, and that's, you know, with us already knowing how the OEM works and the specs they give us and it's in the format we specify. But if it's a new OEM, we're starting all over, and that takes anywhere from six to eight months to do a new system. And then there's also variance; the OEMs will

provide and say, hey, this is the same as system X except for these ten data elements and, oh, by the way, we have to implement new exception logic for certain data elements.

So the exceptions are the tricks, right, it's the -- they combine multiple data that they get from the vehicle and you build basically a formula based on the behavior of the data, and so we pull multiple data elements together to make one data element, and the OEMs specify that and that takes a lot more work. So it just really depends on how many exceptions we have to implement. But typically, a variant may take anywhere from a month to three months.

Q. When we looked at what the CDR tool is, there were a bunch of cables.

A. Uh-huh.

Q. Who's responsible for the cables?

A. Bosch is responsible to build them, to do the tooling, to stock them in inventory worldwide, and make them available commercially.

Q. Where does that fit in the timeline?

A. That goes in parallel. So the first thing we do is figure out whether there's a cable requirement. If there's a cable required, we start working on the

cable. The OEMs will give us basically the communication part, the electrical information to say which pins are connected and such, and then we take that from there. They'll give us some sample parts and stuff, and then we do the drawings, we pay for the tooling, and we do all the product management to manage 125-plus cables, and then also as those cables start to get older, we have to phase those out, and it's just an ongoing thing.

Q. What decides that the tool is finished for that vehicle; what's the process for finishing it, I guess?

A. So first of all, we get acceptance by the OEM about the implementation based on the specifications they provided us. And the OEM does their own testing apart from us on -- so a lot of times they're doing crash testing prior to the vehicle. So they use the test versions to test it out to make sure that the data is being reported as per the specification, or if they have to make a change, they'll feed that back into the development stream for changes, and once they're satisfied with that and they meet their certification date, then they will tell us, okay, you guys can release the software.

In the meantime, we're testing that software kind of in parallel, so when they do say

release it, then we're able to release it in a coming release.

Q. Okay.

A. Which there's roughly four to six software releases every year that include, you know, at least one of the OEMs vehicle coverage; it's multiple, you know, we'll release BMW or Volkswagon, and it just depends on what their alignment is in terms of the timing schedule.

Q. On average, how many new systems does Bosch incorporate into the software each year?

A. Probably about 20.

Q. And what do you mean by systems?

A. Let's say they have a new airbag module, so we kind of have to start from scratch. Now, a lot of times some of the software in their ECUs will carry over, but the OEMs are constantly trying to meet regulations, so they're constantly updating their EDR. So they'll give us a new system and they'll send us an ECU, and we start doing development on it, and again, the process starts over. So nothing stays still in this industry.

Q. And you mentioned variance; how many of those a year?

A. I don't know, probably 15 or so.

Q. Roughly, how many cables a year do you have to make?

A. Anywhere -- well, during the pandemic we were slow in

releasing cables, but now it's picked back up; anywhere from four to ten cables a year.

Q. Do you know what the annual budget is for this tool?

A. Yes. So back in 2019 it was about 1.1 million for development, and that was to support the CDR tool in our existing software platform for all the supported OEMs, so about 1.1 million. So that was a mix of U.S. employees and Bosch India employees as well. Now it's probably closer to 1.5 to -- just depending on how many systems we have. It could be up to 2 million, but typically about 1.6, 1.7 million for content, to add new content.

Q. What do you mean by content?

A. Support for any new vehicles rather than adding new features and functions; this is to keep the vehicle supported for the supported brands.

Q. We're going to come back to this, but I wanted to ask you about releases for a version of software and what it entails, and you can give us that by looking at Exhibit 9. Can you tell me what Exhibit 9 is?

A. That's just a summary of a given -- so we do these four to six releases a year, and every release we send out information for our customers to let them know what vehicle coverage we added in that particular release. This doesn't define all the changes. This

defines, roughly, those more higher levels that are probably pertinent to our customers and the vehicle coverage. The coverage is key. So this lists mainly the vehicles we cover and any other more important changes in the actual product.

Q. When you say the coverage, this is new vehicles being covered?

A. Yes, new vehicle coverage, correct. We produce one of these every release. Actually, every release except for a patch release. A patch is just we're addressing a very specific small issue.

Q. So the exhibit before this is very large and it looks like a list of vehicles; Exhibit 8.

A. Okay. So this is the coverage list we put on our website in terms of what vehicles are supported, and it's in a PDF. I don't know how many pages.

Q. And each version of the software would have a separate list like this?

A. Each major release. So usually three to four times a year, we'll update this document.

Q. So this would include -- we saw two different versions, but this version is 19.4. So this would include the vehicles that were listed on a new vehicle list for 19.4 too, right?

A. Yes, as well. It goes all the way back to 1994

General Motors coverage.
Q. We can go back to 6. We were on 6, page 6 before.
A. Okay.
Q. We can move forward from there. We can continue talking about -- so what is the next page?
A. This is just to give an idea what brands we support. And obviously, there's a lot more brands since 2019 that we've added. But this lists basically the brands and their associated vehicle models are basically assumed here. So General Motors vehicles include, you know, GM vehicles, Chevrolet, Buick, Cadillac --
Q. Sure.
A. -- and Pontiac and Oldsmobile back in the day; same with Honda and Acura.
Q. You can keep moving forward. The coverage, I think you mentioned before how many vehicles are actually covered by the tool?
A. Yeah, in North America back in -- actually, I think this was 2018 data. The total vehicle population was about 297 million vehicles, and the CDR covered 162 million of those vehicles, which equates to about 55 percent coverage of all the registered vehicles on the road.
Q. And that number increases every year because of the aging?

A. Right. Vehicles get taken out of service, get replaced with new vehicles, so the coverage increases.

Q. I think you had a slide here on how it works and you talked about before, so can you refresh again since we have some pictures on how to describe it?

A. Okay. So we support basically two use cases. There's the case where the vehicle is intact and we can retrieve by connecting to the on-board diagnostic table. It's earlier in the -- prior to OBD, they called it DLC, data link connector, and that's the main connector that you plug in your scan tools.

So the CDR tool would support the read-out for the majority of the vehicles through the OBD connector. In the case of an event where the crash is bad enough where, you know, there's no more electrical connections, we have to connect directly to a module, and that's called a direct-to-module connection; that's why we have all these cables and adaptors and such.

Q. What is the output of the software, which is the next page?

A. Okay. Basically, it's a report. The report is very specific to, you know -- it has to be printed. So we've been producing CDR reports so they can fit on a letter size paper; that's one of the main

requirements. And so when people go to court, they want to print out the CDR report. So what we did was we display this on the screen, what it looks like when it's printed, and the report sections are pretty common across all the OEMs; we try to keep that up. Some OEMs insist on calling sections differently, but, in general, they're pretty much the same. We have this report section, CDR information block, then there's a data limitation section, which basically tells the OEM author that, and they explain any issues that are known about that particular CDR report or that particular ECU, and they will update these data limitations regularly, because, you know, they might find something that there's an error or we add new functionality or whatever; these data limitations are key to investigators -- for them to understand potential anomalies that are reported in the report. So that's where the OEMs keep that information. Bosch doesn't offer those; the OEMs do, and they give us a file and a format and then we publish those whenever they're updated.

Anyway, the reports are up to -- I think our latest Mercedes is like 1,300 pages -- no, 3,000 pages, but we can export data on that for our customers to do analysis.

Q. How is the Bosch tool sold?
A. So there's two methods of selling: One is we sell to a distributor, and the distributor has the relationships with the customers and they'll basically deploy the software -- they'll sell the tool to the customer, the software and the hardware. And then we also sell it direct to Bosch -- from Bosch. So in North America we sell direct to Bosch for our OEM customers. So we don't -- unless in cases where they need something quick that our distributor has that we don't, then we'll defer them to that, but we basically sell directly to OEMs in North America.

In Europe, we have a distributor as well, and it's a very similar situation, although they'll actually sell directly to OEMs. In other parts of the world, Japan, they sell direct as well as through a distributor; Korea, same, they'll sell direct or through a distributor; and Australia, they sell direct; and China, they sell to a distributor.

Q. What's the price range for what is sold? If you want to go to the next page.
A. Okay. So the main kit -- and I'm trying to not cause a lot of confusion. So the main kit, which included two VCIs, and there was a legacy VCI and the new CRD 900 VCI, vehicle communication interface, that sold

for $5,800. And with that, basically you can download all the vehicles directly through the OBD connector with a couple of exceptions when they buy that kit, and then additionally they'll pay a $1,200 annual software subscription.

So the base kit includes the VCI, the connectors, the power supply, everything for a user to be able to do a download direct to vehicle, and then they'll buy additional cables. So a lot of law enforcement will buy every cable that we make because they can't predict whether they're going to a crash and whether it's an OBD download or direct deposit.

And the software subscription, we sell one subscription for North America; we have one for Europe; we have one for China and APAC, and every one of those include everything we support in the CDR tool; all manufacturers that are sold or made available to their industry; whatever's supported is in the CDR. We don't update -- we don't change the price when we add a new OEM. We have periodic price increases every couple years, but the idea is that if the customer buys an annual subscription; whatever we release, they get worldwide.

Q. We've talked about the different use cases and there is a slide on the next one, and we'll go over those.

A. So, you know, it's used for reconstruction of vehicle accidents; to find out -- for a lot of things: One is for law enforcement to figure out causation, and for OEMs and other independent accident investigators, it could be a wide range of reasons why they're doing an investigation; anything from a product liability situation or they have been hired by an attorney to do an accident investigation and such.

Also, it's used by insurance companies for fraud detection; that's our main use right now with the insurance companies, is to detect fraud; to see -- they will send out an investigator to determine, one, that their insured is being honest and then they will do a download, and the -- if there's any red flags or something, the person from the insurance company will flag that. Bosch never sees any of these reports; it's just used as a tool and the insurance company owns that data and those reports. And then vehicle safety research, so NHTSA is one of our big customers and they do a lot of crash investigations for product liability issues or potential vehicle safety issues. And then the OEMs, the OEMs use it; one, to test real-world crash data to see, because they do crash tests, but it doesn't encompass all of the potential issues, so the OEMs actually will deploy a team that

will go and investigate certain crashes and feed that information back to their product development team, and also they use them to defend product litigation.

Q. Who is Bosch's main customers in North America; what type? You can go to the next slide.

A. So the main customers right now is law enforcement, independent accident investigators, insurance companies, fleet owners, the OEM themselves, and government agencies, TSB, and NHTSA.

Q. And then how is that broken down?

A. Basically, by now -- right now it's mainly law enforcement; that's our largest customer base; then the private sector, accident reconstruction is next; insurance is coming up; and then others are like fleets and other possible use cases.

Q. So this was 2019?

A. Yes.

Q. Is it any different since 2019?

A. I think maybe the insurance business is picking up a little bit, but not as much as we expected. It's still probably this priority in terms of our customer saturation.

Q. In 2019, what did Bosch think was going to drive the market?

A. Well, the insurance business was picking up, and then

COVID hit and that dried up a little bit, and it's starting to come back. So we think that potential insurance cases are possible; it's still a possibility.

Q. We can move to the next slide.

A. So the market drivers, again, are the initial regulation CFR49 part 553 which was released in September of 2012, any new regions. So for example, China released their requirement in 2020; Korea in 2015; Europe 2022; Japan, I don't know exactly what's going on there, but it's kind of a pseudo regulation. They have a relationship with the OEMs, the government does, and it's kind of like an honor system within Japan as far as I know.

And then the other driver is the active safety systems and ADAS technology, that's a big driver now. We're getting a lot of -- it's not a good business case at this point, because there's very little amounts of vehicles on the road that have an ADAS or a level four driving, but eventually that's where technology is going.

And insurance fraud detection; who hit whom first, the OEMs -- the insurance companies do a lot of that, to figure out dispute claims.

Q. In 2019 -- you can go to the next page -- what

insurance companies were customers?
A. So all of these that are listed. Geico was our biggest insurer, Progressive was coming up, Allstate, USAA, Liberty Mutual was a good customer, still are, Farmers, I don't think there's a lot of activity. There's also another one, that's Fred Loya, it's an insurance company as well; and American Family, we had one subscription with them and they haven't renewed in the last year.
Q. So the top of this says that in '19 there was approximately 300 kits --
A. Yes.
Q. -- is that what that means?
A. 300 subscriptions.
Q. And is that number -- what is that number now?
A. There is about 200 Geico customers. The next one down is Fred Loyal is 100, and then there's Liberty Mutual, which is like 39, and there's Travelers Insurance, which is like, roughly, I think, 25, and then there's Farmers -- I'm sorry, State Farm, I think there's one, and there's a couple other small ones; so it's about 389 subscriptions today.
Q. So it has increased?
A. Yes.
Q. Okay. The next slide is use cases, which I think you

already talked about.

Go to the next page. Who is Crash Data Group?

A. They're our distributor. They've been with us, gosh, back when we first started selling the CDR tool. They're based out of Temecula.

Q. By distributor, that means other than OEMs in North America; that's where you would have to get your subscription?

A. Yes. And they also sell other kits like Tesla and Kia, Hyundai; they do their own kits.

Q. That's a good segue into who else makes crash data retrievals from -- with the OEMs?

A. JLR, Jaguar Land Rover.

Q. Do they make their own?

A. Soon they probably won't, but they do -- they have their method for retrieving data and giving our customers what the -- what is expected in a CDR report, but they provide their own method for doing that. I think they download the data with their dealer tool and send the data to JLR, and they create a report and send it back to the customer.

Q. And you mentioned Tesla. Does Tesla --

A. Tesla is kind of unique because they want to do everything inhouse, so we started working with them

and they decided to do their own. But Scott Baker basically sells the hardware that enables the customer to retrieve the data, and then the customer signs on to a Tesla website and it gives them the report.

Q. And you mentioned Hyundai and Kia.

A. They have their own tool. It's a dealer tool and they sell the kits through Crash Data Group as well.

MR. ZELLER: How often do you want to take breaks?

THE ARBITRATOR: Maybe every hour and a half or so, if that works. But if people need a break before that, or if our reporter does, just let me know.

BY MR. ZELLER:

Q. You talked about the software subscriptions being one year, is that right?

A. Yes.

Q. And it has to be renewed every year?

A. Yes.

Q. Are the subscriptions covered by a license agreement?

A. The agreement is in the EULA, end user license agreement.

MR. ZELLER: I'm going to show a demonstrative, if that's okay.

THE ARBITRATOR: Sure.

MR. ZELLER: Let's mark it Demo 1.

MARKED FOR IDENTIFICATION:

DEPOSITION EXHIBIT DEMO 1

10:19 a.m.

BY MR. ZELLER:

Q. Can you tell us what this is?

A. So the releases are in the left column; basically, those are the public releases. The middle is basically the date that that was released on the Bosch website. And the EULA version is basically the version of the EULA at that given release.

Q. You verified all these dates, is that accurate?

A. Yes.

Q. So I want you to look at Exhibits 3, 4, 5 in your binder. Can you tell me what those exhibits are?

A. Those are crash data invoices for Collision Sciences.

Q. Specific for what?

A. For the software license agreement; software licenses.

Q. When did Collision Sciences purchase their licenses?

A. According on this --

MR. MONSMA: I'm going to object to the foundation.

MR. ZELLER: Okay.

THE ARBITRATOR: Overruled. Go ahead.

A. So October 27, 2015 was their first license purchase

through Crash Data Group.

BY MR. ZELLER:

Q. I'll stop you. Where did you come about these invoices?

A. I asked Crash Data Group to provide us the invoices from Collision Sciences.

Q. So the second one you said?

A. That was January 26 -- I'm sorry, no -- yeah, January 26th.

Q. What year?

A. 2018.

Q. Okay. And the third, Exhibit 5?

A. That was July 9th, 2019.

Q. Based on the demonstrative, can you determine what EULAs were applicable to these licenses?

A. Yes. So the 3.8 to 17.0 was basically the original -- well, not the original because that was started at 3.8, and in 17.3 -- 17.2, sorry, we updated the license to include the name change from Bosch, LLC to Bosch Automotive Service Solutions; that was the only major change.

Q. Okay. So the third license in Exhibit 5, based on your demonstrative, what EULA would have been in place at the time of that license?

A. Dee. So that would be 18.0 -- no, 19.0; that would be

the version to basically December 6th, 2019.
Q. Can you look at Exhibit 1 in the book?
A. Okay.
Q. Can you tell us what Exhibit 1 is?
A. EULA license agreement for the activation of the CDR software.
Q. What version is this applicable to?
A. That would be applicable to -- so we made a change here, so it would be 17.3.
Q. And look at Exhibit 2 and tell me what that is.
A. Okay. This would be applicable to, let's see, 19.0 release, which is released on June 6th.
Q. What year?
A. Sorry, 2019.
Q. Okay. And has the EULA changed for the Bosch software since that time?
A. Since 19.0, no.
Q. This is the current version?
A. Correct.
Q. Okay. I want to talk about how a user installs the software.
A. Okay.
Q. And if you can look at Exhibit 7. Tell me what this is.
A. That's the installation guide in 2019, I believe.

IOS, and then it seemed like back ends for IP service that was tying everything together. And lastly, I was provided access to Amazon Web Services for Collision Sciences, which included some databases and some other web applications. So that was the first task, was to search for the presence or use of Bosch CDR software.

The second was to search for evidence of quote, unquote, reverse engineering of the software.

Third was to search for evidence to determine how the CrashScan software is updated with new vehicles insofar whether the process utilizes data from Bosch CDR software.

And then lastly, index and search a list of keywords and review the results as related to those three tasks. And obviously, I reserve the right to supplement, because you usually want to do that especially when it's early on; you never know when more can come out.

Q. All right. Can you describe the general process that you did to conduct the audit?

A. Sure. So there were a few hurdles to getting connected, but we did get connected. I used a software tool called dtSearch to index the audit laptop and search for a number of agreed upon keywords, as well as additional keywords that I

provided to counsel after the audit was done.

I reviewed thousands upon thousands of hits for those keywords in order to try to understand and process those four elements in the scope of work on how Bosch's CDR software was used in relation to Collision Sciences' systems.

One of the terms of the audit required me to record video of every activity that I performed on the audit system repository and the Amazon Web Services; that was an additional layer of overhead. It can take a bit longer when you have to go back to review hours of footage to figure out what's done rather than going to check the image to see what the search results were, so that added a layer of complexity, but it was fine.

Q. You initially said you had some problems getting connected?

A. There was some issues with TeamViewer, which ended up being the tool I ended up using for remotely accessing and viewing the data, but everything was ironed out.

Q. Maybe we're missing about why you had to remote access?

A. Oh, so originally I requested a forensic image, which is what I'm used to working with on these sort of cases. Forensic image provides additional value

rather than a live system, because often it will include information about deleted data, which I wasn't sure if that would be relevant or not at the time, but it's always helpful to be able to search to see if there are any useful bits of information in the trash, so to speak, and that evidence is not always available in a live image.

Q. So let's go over what the findings of the audit were.

A. Okay. So first finding was related to that question of whether the Bosch CDR software was installed on the laptop. It was. There were logs and registry entries and a lot of other metadata and computer information indicating that it was installed a lot of times. It looked like there might have been an automated process to install and remove it. I don't know why and I didn't want to speculate on why that was happening, but there were versions from between 16.4 all the way through 21.5 of the Bosch CDR software that had been installed on that audit laptop.

Q. How were you able to tell what versions?

A. It was included in the log of the installation. I can't recall if it was also in the log of the uninstalled.

Q. And we'll just go through the summary really quick.

A. Sure.

Q. So what were the other findings?
A. The other findings was that respondent incorporated the CDR software or the CDR-Replay tool. I found the video, which I'm sure we'll be talking about from April 3rd, 2018, which demonstrated how the CDR-Replay tool from Respondent was used. That was really the most useful bit of evidence, because it showed in real time exactly how Bosch's CDR software fit into the processes in this replay tool that I'd been seeing and referenced in documents, and were displayed step by step how the process went, what CSI was looking at, what pieces they had written. There were some python code that makes a special file; there's a lot of steps to it that are described by a few of the other documents. But they say a picture is worth a thousand words, so I don't know how much the video is worth, but it's probably more. So that was one of the big findings from the audit.
Q. Go ahead. Keep going.
A. Sure. Regarding the incorporation, there was also a bus-sniffing tool named BUSMASTER that was installed; it's part of this process of replaying CDR. It looks like it's used to eavesdrop on the messages from -- into the Bosch CDR software. There were some C++ files related to BUSMASTER and CDR-Replay that they're

not reviewed during the audit. I put it this way because I wasn't sure if they were there or not at the time I wrote this, and I might not have reviewed them. There were several things that I did not know the importance of at the time of the audit that became more much clear later on.

And then there were scripts used to automate the running of the Bosch CDR software on the laptop, related to a tool called Audio Hit. From all the evidence I saw, it looks like it was an early attempt to run the software without any human intervention. I don't know if it was maintained. Most of the evidence doesn't suggest that it was continued past about 2016. I think I have some answers for Tim on that from my depo as well, as I'm sure he'll give to me.

And then next there's evidence on the laptop related to potential reverse engineering of the Bosch CDR software. We're in agreeance that the definition of reverse engineering is going to be very important, and I certainly acknowledge that in my audit and in my expert report. It's unfortunately going to be up to the Honorable Cranmer here for that decision. But potentially reverse engineering of the Bosch CDR software using PyCharm, which is a

Python-integrated development environment, IDE, as well as from the data that they were retrieving and viewing coming out of the Bosch software using BUSMASTER; those are all that could be considered part of reverse engineering efforts.

And then Respondent installed and used Bosch CDR software licensed to others. The laptop contained Bosch CDR software license files for several versions of the Bosch CDR software to companies that were not responding; namely, StreetDelivery and also BioLogic Forensics. And then there was also one occasion where the software licensed to StreetDelivery was run on the laptop, audit laptop, on July 19, 2022. The only reason I know that is because it crashed and when it was crashed, there was a Windows log that is generated that says, hey, this program crashed, it was CDR from Bosch, it was version 21.5.1. So that number could be much higher, but the evidence on the laptop only showed that one version crashed on that date.

Let's see, Respondent's source code repositories did not include a repository for CDR-Replay controller. Again, I don't think I understood the importance of CDR-Replay at the time of the audit or the time of the requests. So it was mentioned here, the CDR-Replay controller was a

repository, mentioned I think in passing in some e-mails I've seen from Steve. But I think it probably would have been useful, but it's hard to say. I don't know what it contained, but it wasn't produced and that's all the finding says.

And then lastly -- I know it's a lot -- the CS production database appears to be based an expanded from the one shown in the April 3rd, 2018 video. That finding is based on comparing the visible database fields from the video with fields that I found in the database in Amazon Web Services and there's a pretty reasonable mapping of field data from what's available; enough to say that it's more likely than not that at least that table was based on the table shown on the video.

Q. Okay. That's a good summary. I don't want to have you read from this. We'll go through and talk about it --

A. Sure.

Q. -- but the evidence that the Bosch CDR software was installed, where did that come from?

A. That came from the DT Search and the logs that I found of installation. I'm sure it's covered here, but I found hits. The way that DT Search works is it indexes all the files it can and then it will show

hits on search terms. So I went through -- to the files where there would be hits for search terms for CDR or CDR software or Bosch or whatever the term was, and then I found 325 instances of these individual log files. There was a log every time it was installed or uninstalled. I believe those logs were just of the installs.

Q. And the log files indicate what version?

A. It was a variety of versions. So from 16.4 through 21.1.5.

Q. But you could tell what version --

A. The log tells you what version it is within the log itself.

Q. Okay. You mentioned crash file -- a crash that occurred once. Was there any other data like that that showed different installations?

A. There were a few different crash dumps. A crash dump is something that happens in Windows where an application crashes and a developer has chosen to implement it. It will make a file that tells you, hey, this application crashed or hung. Windows will generate a file that basically says this application, you know, we were waiting for it to come back and, hey, it came back; that's a hang. We were waiting for this application, it never came back, it disappeared;

that's a crash. There were logs of a few different versions of the Bosch CDR software happening, crash or hung.

Q. Let's move on to CDR-Replay before we go through the video. You can tell us what you found what CDR-Replay is.

A. Sure. So my understanding of the CDR-Replay tool from Respondent is that it takes a quote, unquote, trace captured from a vehicle and it allows Respondent to quote, unquote, replay that trace as if it were connected to a vehicle in order to generate a Bosch CDR report using a conjunction of tools, including the Bosch CDR software.

Q. Exhibit 38 is the video. Would it be best to play the video and then go through your demonstrative?

A. Whatever is easiest for you.

Q. Actually, it's Exhibit 37.

(Playing video.)

BY MR. ZELLER:

Q. We just saw the video. I understand you made a demonstrative to walk through the video.

A. Yes.

Q. Do you want us to direct this --

A. Sure.

Q. -- of what we saw?

A. So this demonstrative is comprised of screenshots from that video that we just watched in full, just basically pausing at each action. So it's the same content just in a format that's not going too fast for the court reporter or anyone else. So we can start from the slide. So would it be possible to zoom in?

All right. So this is from the very start of the video. The user that's generating the video, again, this is from what I believe to be Mr. Brian Hsu's computer. I believe it was an image of that computer that was made available to me. The user name was Brian. So user navigates to app.collisionsciences.pa/phdadmin; this is a database interface from the web for PostgreSQL; it's just a type of database.

Q. And you said this is a form of database?

A. It's a database server.

Q. Okay.

A. A database engine, databases and tables in it. This is just one type of database. Microsoft SQL, MySQL, Postgre is just another type of database.

This is the log-in page for the database, and we can go to the next one.

It's going to be a little repetitive here, but I will try to talk slow. This is the user logging

in to the database pressing the log-in button, user name and no password. Click log-in. And then go to the next slide.

After the user is logged in to the database, we have this database named cdr, all lower case, on the left. They're clicking on the tables. So you can see the tables that are in the database, there's a default Postgre table and then there's also a CDR database table. And then we can go to the next one.

So they click into the CDR, and then we're at the CDR_data table and then they click on browse to see the data inside. And we can go to the next one.

So this is the data inside of the database. So in the video this took about five seconds, so I've already spent more on it just on this slide. The user goes and finds a particular entry in this CDR data table for a 2012 Toyota Camry. I think it's the last entry, and they click on hit in order to view the data.

Q. Before you do that, were you able to tell what data you see here; what this data is?

A. This data appears to be -- well, this is data in the Postgre database, April 3rd, 2018, whenever this video was made. The CDR_data appears to be json data

gathered by Collision Sciences from vehicles. I don't know looking at the data if it came from being connected to cars, what app was used, how that was generated, but this is, I believe, the CDR data is what we called the quote, unquote trace for this project.

Next slide.

Q. What does the VIN and vehicle represent in this database?

A. I believe the VIN is the VIN number of the vehicle from which the trace is captured, and then the vehicle appears to describe the year, make, and model of the vehicle.

Q. Okay.

A. Now the user has clicked into the record for the 2012 Toyota Camry and then they end up going down to the CDR_data field, which, again, it's typed json. They click and select that whole field, which is partially cut off. They copy it and then they paste it into a json formatter to make it pretty and make it compatible with the next steps they're going to do. So we can go to the next slide.

Here we are at the json formatter. The user copies their json data, they paste it in on one side and then they format onto the right side, and

that pretty, beautified code they copy and paste into an input.json text file, which is going to be used to help generate the CDR-Replay. We can go to the next one.

So here's the input.json file. You can see it's in Brian's folder, PyCharm projects. Again, PyCharm is a tool used to write source code, which is a programming language, that's in a json processor folder. The file name is input.txt and it's a json file. And then he opens that and we go to the next slide.

I know it's a lot. I apologize for the detail here, but it's good to get it all on the record.

Here's the input.json file. It's opened in a program called Notepad++, which is a wonderful text editor, and I recommend it to everyone. See, he agrees. And then you paste it in and then saves the file, and then closes the file. Then we can go to the next slide.

So now we are over in -- I believe this is in PyCharm. We are in replayfilemaker.py. So this is a Python script file that is designed to make a special replay file, which is necessary to run the CDR-Replay based on the input.json file text that we

just saved into the text file. This screenshot is of the user clicking run replay file maker, and that runs the code in the file and generates a replay file in text. Then we can go to the next one.

So as stated, there's the replay, filetoreplay.txt file, that's the output from the replay file maker. The user moves it to the CDR-Replay folder from where it is. They get a prompt, which is on next screen. Go to the next slide, which says are you sure you want to override it, there's already a file there, and they say yep, I want to put this new one in; please do that. And then we go to the next slide.

Now we are in the CDR-Replay folder. I'm not sure quite where the cursor is. Can you scroll down a little bit more, please? I think this is the VIN part that I'm not 100 percent. Yes, so this is a file called vin.txt, again edited with Notepad++. And on the next screen you'll see what comes up when that's done.

Oh, that's right, he doesn't go straight -- he goes to grab the VIN from the database. So the VIN for that same 2012 Toyota Camry, selects the VIN number, copies the VIN number, and then pastes it into the vin.txt file, which should be on the next slide.

So it's a lot of steps that all happen very, very quickly. And then the user saves the vin.txt, and then we go to the next one.

So now we're getting into more of the tools and applications that are running. So this whole time at the bottom of the window there are several programs open: One of them is BUSMASTER, Bosch's CDR tool, there's the Chrome window for the database, folder for CDR-Replay, Notepad++, and PyCharm. So those are almost all things we talked about already except for BUSMASTER and the Bosch crash data tool. Right now the user brings up the BUSMASTER window, which was open, and brings it into focus and then clicks connect. Next they bring back up the Bosch CDR software. If you scroll down, you'll see the version from this video was version 17.7, which I know is relevant for various reasons related to EULAs, but this is the version that was being used at the video. You can go to the next one.

And then the user puts these two folders side by side so that they can see what's happening in BUSMASTER alongside what's happening in the Bosch CDR software, and then they click new on the Bosch CDR software. When they click new, Bosch software prompts them to select the brand. They select Toyota, so

we've got our lovely, nice, reliant 2012 Toyota Camry. We can go to the next one.

Then user presses the button to read the VIN from the vehicle. Then you can go to the next slide.

Now the Bosch software is attempting to read the VIN from the vehicle here. And you can go to the next one.

And then a stream of data starts coming across from BUSMASTER as it's listening to the messages that are going across, and also see in the trace window the VIN has populated for BUSMASTER on the left. It has also populated inside the Bosch tool. So the VIN was properly retrieved.

And then we get to a screen on Bosch where you need to just -- if you choose to, you can enter a user or case number. The imaging date is automatically populated. The crash date. The user here just clicks done.

So after that, the user clicks on the airbag module, that blue icon up there with an airbag inflating in front of a person, and we go to the next one. We're almost there, guys. I know it's dry.

And then it says reading data for module, and then you can see some more security access keys

have populated in the trace window, and BUSMASTER is continuing to populate data. I think it takes three, possibly four, pass-throughs, and then we get to the next slide.

It asks if you want to save the recovered data; the user clicks no, and then we get to the next one.

And the Bosch CDR report has been generated. If you zoom in on the report, you can see it lists the version imaged with as well as the reported with CDR version, which Bill Rose was talking about earlier. There's different versions. We can see the software was licensed to Collision Sciences. They clicked the airbag control module. And this is the Bosch report that has been generated. Again, this is CDR-Replay. I would assume this was done without being connected to a car, because the json data was pulled from the database, and a lot of documentary records suggest this is how the replay data was used.

I think the next few slides might be more of the report, but it includes the hex data. The user just opens the report and scrolls through apparently to validate the data in the report, and there's the hexadecimal data. That's it. Fun for the whole family.

Q. Did you find information on the computer that helps shed light on the meaning of the video?
A. Yes.
Q. What did you find?
A. The most useful document I found was a document called Summary of Code. It appeared to be put together by Respondent sometime after they had gone through some efforts to build a CDR-Replay tool. Based on the contents on its face, it appeared to be attempting to understand and reconstruct what an earlier developer had provided for them and explain what each piece of the software was to do. So there's an API, Serverus and several other elements that are all listed in the report. There were notes and a lot of other documents related to developers on that computer. Page 21 is helpful as it describes CDR-Replay.
Q. In the notes?
A. This is from the summary.
Q. Right. I think that all went into your explanation here about your understanding --
A. Yes, I believe so.
Q. I think we can move on to the other parts of the audit.
A. Sure.
Q. We'll talk about CDR-Replay in particular when it

Q. Okay. You had access to the Amazon Web servers you said for Collision Sciences' database, is that right?
A. Correct.
Q. What did you find there?
A. So I was able to search through their Amazon Web Services instances. My focus mainly was on the database as it related to crash and CDR software, and I examined the CS production database to look for whether it was similar to the database that I saw in this CDR-Replay video. It appears that the CS production database has a table in it for CDR data that appears to be greatly expanded from what was present in that video, but it does appear to contain the same types of data, at least in the subset that are visible, which, again, would lead me to believe that this table is an updated version of what they were working on April of 2018; more likely than not.
Q. I believe you compared the size between the two, and I'm sorry to make you find that back, but if you could point that out, it would be helpful.
A. So in terms of just a number of tables, the CS production database contained 69 tables as opposed to the basically one in the one that was visible in that video. So they've obviously done a large amount of development on tables that are not related to that CDR

data table. Within the CDR data table, there's ten visible columns in the video; nine of which appear to have direct analogs in the new table and one appears to have been split out into three different columns where we saw there was a field that had the year, make, and model all in one field, and that's now been split into year, make, and model in the newer database, which makes sense.

Q. I think it's on page 51, the number of rows that you talk about.

A. So the number of rows is about how much data is in the table. There's a lot of data. There's 86,067 rows in the new one as opposed to 1,057 in the one from April. Again, it appears to contain the same type of json data, but the unique identifier for the rows appears to have changed in format. So it looks like it's a hex value here in the screenshot where it was a number before. There's obviously a whole lot more entries for vehicle scans in the newer database than the one in the video.

Q. What does each row represent, first, between the tables that we were looking at?

A. I can tell you what each row appears to represent.

Q. Okay.

A. And that is it appears to represent an individual

unique scan of a vehicle using Respondent's CrashScan tool, as far as I can tell. So when they do that, they will generate a json file and they put that in the database, and that's where that json information comes from when they get a trace. Using their mobile app, they capture it and put on it the server; that way that json data is available, and if a customer says, hey, we need to do a CDR-Replay or something weird, then they can take that json data and follow the process we saw just there in the CDR-Replay and run the CDR report, and then they can say, okay, based on the Bosch report, it looks like this number was wrong or maybe the Bosch report is wrong, but there's something going on here. Oh, hey, we missed this in our app, let's fix this in our application, and then we can send out a new report, or if they really want the Bosch report, they can send them the Bosch report that way.

Q. In the video, I think you said 1,057 rows?

A. That's what I saw.

Q. Would that have been data from their CrashScan application?

A. Again, that's my understanding; that's what it appears to be is the traces captured from the vehicles. They go on and plug in, scan it, they put it on the server,

and if that data is then ready to either go into their own reports -- you know, I think in their repository there's code for generating reports from their own data; that json data can also be used for CDR-Replay; that's two different pathways from what I can tell.

Q. How much time and effort did you put into the audit?

A. I don't know offhand. I'm sure that I've got my invoices and I can go look it up. I think I provided some of that.

Q. Well, we've added to the exhibit the invoices that you had.

A. Okay.

Q. I know that you just provided that to us.

A. Yep.

Q. And so the invoices that are attached, what's their timeframe?

A. Let's see, August 22 to August -- the end of August -- let's see, whenever that report went in, what is the sign date? Let me check. I think it was the 31st, July 31st, 2023.

Q. So from the time that you started the audit process or preparing for the audit process until you signed the report, how much did DisputeSoft bill, roughly?

A. I think it was -- I'm trying to think. I think it was around 110,000.

Q. Okay.
A. I don't recall. I know I ran the numbers once, but that was a week or two or three ago, but I should be able to add up all the invoices to get the answer.
MR. ZELLER: That concludes the audit process. Time for a break?
THE ARBITRATOR: Yes. Let's take a 15-minute break, and we'll be back after that.
(Off the record at 2:27 p.m.)
(Back on the record at 2:49 p.m.)
BY MR. ZELLER:
Q. Mr. HelfinSiegel, you were also asked to provide opinion testimony in this matter too, is that correct?
A. That's correct.
Q. I think you can refer to your report, if that's okay?
THE ARBITRATOR: It is okay. Steve, do you have an extra copy of that? Mine says it's reserved. If you don't, what we can do is maybe at the end I'll just take the witness's copy or something.
THE WITNESS: I have a hard copy printed out if you want me to grab it.
MR. MONSMA: Sure.
THE ARBITRATOR: Thank you.
BY MR. ZELLER:
Q. Okay. In short, what opinions were you asked to give?

A. So I was asked to look at four different areas: How is the Bosch CDR software related to Respondent's CDR-Replay tool, which we spent some time on.

Does Respondent CDR-Replay tool allow the Bosch CDR software to run while not connected to a car?

Is there evidence indicating the presence and/or use of the Bosch CDR software by Respondent in the audit systems or documentary record and that appear outside the scope and time period described by Respondent's software licenses?

And is there evidence in the documentary record that Respondent quote, unquote, reverse engineered the Bosch CDR software and/or does Respondent utilize data extracted from the Bosch CDR software or utilize the Bosch CDR software itself to update new vehicles in Respondent's crash data software. So those are the four areas I was asked to opine on.

Q. I think I'll ask you what your brief conclusions were on the four areas and then we can talk a little bit more in detail.

A. Sure. So we did cover a lot of similar ground in the audit report, but based on the materials I've seen, the CDR-Replay tool it is based on and incorporates

the Bosch CDR software, that was that video you guys saw. You know, it's used with BUSMASTER and some Python code and some additional things. It's a key component where if you take it out, that CDR-Replay does not work.

Respondent's CDR-Replay tool runs the Bosch CDR software without connection to a real car. There's a lot in documentary record about this. I remember seeing something about specific hardware being used to help in that process. And again, that was the stated goal of the CDR-Replay as well, is to run while not being connected to a car. And again, this is all more likely than not.

Bosch CDR software versions were installed that appear outside the time period. This was, again, a request to see if there were versions installed that were different or past the years that would be indicated on the invoices of the licenses I was able to review.

And lastly, that the CDR-Replay tool incorporated the Bosch CDR software as used to verify, correct, and improve CrashScan's own product. And it provided a similar CrashScan functionality, was all part on that last one.

Q. Good. I'd like you -- for everyone, we're only going

to talk about three out of the four.

A. All right.

Q. What did you do for your preparation for these opinions?

A. Well, I performed the audit, so that gave me a lot to work with. I also reviewed a lot of material in the documentary record, reviewing and understanding technical documentation and materials related to source code and that sort of thing; reviewing, understanding, translating that information as often as is relevant and helpful for a trier of fact when going through the documentary record. It's required on almost every case that I worked on. I reviewed Mr. Hsu's deposition transcript. Everything that's cited in the report as a material considered or footnoted is materials I relied upon.

Again, the most telling is just the CDR-Replay video demonstrating clearly how everything worked, at least as of April 3rd, 2018. I believe there's also testimony from Mr. Hsu saying it functioned in predominately the same way in 2020 at least until 2023, I think. I don't recall exactly.

Q. Let's talk about that one first, CDR-Replay and your opinions about it.

A. Okay.

Q. What's the basis of your opinion of that CDR-Replay incorporates the Bosch CDR tool?
A. Again, it's a culmination of a variety of materials. So reviewing the developer docs that were present on the computer, the documentary record, the summary of code describing how the tool is supposed to work, deposition testimony; just everything that I had seen in terms of evidence on the audit laptop as well, combined with the video demonstration all point to that tool, CDR-Replay tool, incorporating the Bosch CDR software.
Q. You said that the CDR-Replay wouldn't work without the Bosch software?
A. Correct.
Q. Would it have any function?
A. I don't think it would have any particular function because you need to use the Bosch CDR software in order to listen to the messages from the Bosch CDR software, and eventually generate the Bosch CDR report. So I think the software is the beating heart of the replay tool at least as described here.
Q. We saw the video and a lot of description about it, but one thing we haven't talked about, and maybe you can explain what your understanding of it was, was how is this physically set up?

A. Again, so this is my understanding is that there's a laptop computer or desktop computer, a PC, Windows PC, with the Bosch CDR software installed, the BUSMASTER software installed; obviously has to have access to a database if you're going to pull the json data; to properly format, you need the tools to format it so that it can be read, and then you need some sort of connector to -- I think it was like an OBD mockup, and then I believe there were two devices, but I'm not 100 percent certain on everything I saw; it was not a focus of my main investigation. I just remember seeing some e-mails from Respondent about building a special cable and/or some special devices that they were looking at, but I don't understand that part that well.

Q. Okay. Can we talk about the documentary evidence and how that supports your opinion?

A. Sure. So again, the Summary of Code, which is the one that I enjoyed because it's a lot of -- easier to understand English, describes how the CDR-Replay tool was to work. I mean, there's also several corroborating e-mails about the development of the CDR-Replay tool, what the goal was, what they were trying to do, use CDR without being connected. It had a lot of different developers I think working on it,

that sort of thing. It should be in the citations in the report.

Q. Do you know what versions of the software CDR-Replay was used with?

A. I know it was definitely used with 17.7 per the video. I believe it was used in later versions based on the work logs of Mr. Hsu and requests for CDR-Replay that show up. I'm trying to think. I think there might be some other e-mails, but I can't recall as I sit here. If you can jog my memory, it might work.

Q. Toward the end of your section in paragraphs 33 and 34 you talk about the work logs. Can you talk about what the work logs were?

A. Sure. The work logs appear to be invoices from Mr. Hsu for work performed. The ones that I specifically called out in my report were related to mostly using CDR-Replay to enhance and improve the CrashScan application.

So there were requests often sent by Jason Bayley or by other folks to either solve issues or a client says, hey, we really need your CDR-Replay, can you get us a CDR-Replay, can you get us a replay of that, and then Mr. Hsu would do the replay and then would say, oh, I found some issue. I fixed this in our vehicle.py, Python code, now ours is working

correctly, and that was what the type of material that was in those work logs demonstrated. At least those logs indicate that it appeared to still be in use at least as of May '22.

Q. So your next opinion was that CDR-Replay doesn't need to be connected to a car --

A. Correct.

Q. -- right?

A. Yes.

Q. What supported that opinion?

A. So again, the video -- it's going to be a lot of the same things: video, Summary of Code, documentary record, stated goal of the tool is to be able to run it without being connected to a car so you can generate after-the-fact a Bosch report.

A lot of the correspondence and things that I saw were about, hey, we've generated our report, customer really wants a Bosch report, so let's go to CDR-Replay and get the Bosch report. That's not going to be possible to do that just in the back office unless they bring the car and connect it. I'm trying to think of the other elements, if there were. A lot of replay versions of reports. I have the ability to generate reports in our lab; again, that seems to indicate it's happening in the lab and not out next to

a car. I'm skimming these --

Q. That's all right. Do you have evidence of CDR-Replay being used post June of 2019?

A. Again, the work logs indicate that the CDR replays were being run, and I believe -- I don't recall exactly the Hsu deposition testimony whether this was asked or not, but I believe the Hsu deposition said this was the same CDR-Replay tool we've been talking about.

Q. You have a lot of examples in your report on that usage. Would you mind -- for example, 37, paragraph 37, if you mind explaining just a couple of them and why they support your opinion?

A. Sure. I think 37.12 is good on page 29. Jason Bayley also writes for our telematics purposes now, the CDR Bosch software can have that order info (vehicle, VIN, date) entered manually (and then click we run, collect ACM data; it is at this point we play back our json file; the Bosch CDR hardware/software thinks that it is plugged into either an airbag module or a vehicle.

So again, it just seems like they're trying to get it to believe it is connected, though it is not.

Right above it, we need to focus on playing back json files while running some other app like fake

cdr or live cdr, which basically makes the Bosch hardware think it's plugged into a vehicle or an airbag module. This is in 2017. Again, by April of '18, it looks like they were largely successful.

Q. On that page, you had a couple that appear to be from 2020.

A. Let's see.

Q. 37.9 and 37.10.

A. 37.9: Here's the report containing raw hexadecimal data with the Bosch CDR software version 19.3.1 report attached. There's a 19.4 in the next one --

Q. Okay.

A. There's several citations. 37.14.5 on page 31, Brian Hsu writes I finished writing a program in CAPL that would trick the CDR into thinking it's talking to my car, and it attached a file named BoschCDR.txt. I mean, there's a preponderance of evidence here.

Q. Is it your opinion that CDR-Replay was in use after May of -- after June of 2019?

A. I would say that the evidence supports that it's much more likely than not that it was still in use based on all of those reports and correspondences, at least between January 6, 2020 and May 11, 2022.

Q. If you go to your last one, your fourth opinion.

A. Okay.

Q. You said that you have the opinion that the CrashScan app is similar in reporting functionality as Bosch's tool, which by leveraging CDR-Replay, it's used to continually verify and update CrashScan, correct?
A. That's right.
Q. What's the basis for that opinion?
A. The basis for that, at least the back half of that, is primarily Mr. Hsu's work logs where he describes in detail when he's using CDR-Replay, and then I focused on searching through the record on instances where it appears to be the code was being updated or the CrashScan application, in addition to hits for CDR-Replay. So the entries that are in here largely have to do the CDR-Replay tool and improving coding elements that I knew were part of the CrashScan tool or the CrashScan app, like vehicle.py is a Python file, that's part of the CrashScan app. Again, at the highest level, it's my understanding, at least, that both the CrashScan application and the Bosch CDR application provide reports on vehicle crashes and crash data.
Q. Where does that understanding come from?
A. That's comes from the marketing materials I've read in terms of the documentary record. I'm not sure if I've seen anything else from Mr. Rose or anywhere else in

the record. I'll check what I cited here.

I think it was mostly based on that and understandings from counsel, and from materials that I reviewed in the documentary record. I can't recall offhand other than looking at the reports.

Q. How is that -- or can you explain what you mean by it's used to continually update and improve and refine the CrashScan product?

A. Sure. So a good example here is 51.14, page 42. Mr. Hsu writes: Replayed and checked a 2006 Saturn Ion. RIP Saturn. The report looks good, but the longitudinal Delta V was off by 0.02 miles per hour. Fed fake values back to the CDR to get more accurate resolution; updated the resolution in Python.

The CDR-Replay tool was used to improve the Python code for Respondent's CrashScan software, and there are many instances of that.

Q. Maybe break that down. What's your understanding of what that means?

A. So my understanding of what means is that there's a report for a Saturn Ion 2006 that they replayed in the CDR-Replay. The report looked good, but the longitudinal Delta V -- and again, I'm not a crash expert so I'm not going to tell you what that means -- but it was off by 0.02 miles per hour. They fed the

fake values back to CDR to get a more accurate resolution and then they updated the resolution in Python.

So it sounds like they ran it, they saw it was off, and then they put a fake value back in and they updated their code to improve the CrashScan product. There's several -- many instances of that here. I don't know how many citations I have, but they're spanning a long period of time.

Q. And when did that occur that you were just talking about?

A. That one is on April 3rd, 2020, but there are several more. They go -- if I remember right, they go at least until 2020 in terms of the work logs. I don't recall if I had all the work logs either. I just have what was produced to me. This was about from five invoices containing ten weeks of work for Mr. Hsu, so I don't think it was the full gamut.

Q. Were there any other opinions that you developed for this report?

A. If I developed it, it's in the report, so that should be it.

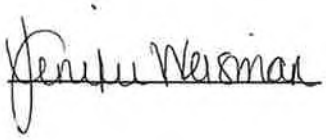
MR. ZELLER: Okay. I'm finished.

THE ARBITRATOR: Okay. It's about ten after 3:00.

CERTIFICATE OF REPORTER

STATE OF MICHIGAN)
) SS
COUNTY OF OAKLAND)

I, JENIFER WEISMAN, hereby certify that I reported stenographically the foregoing proceedings and testimony under oath at the time and place hereinbefore set forth; that thereafter the same was reduced to computer transcription under my supervision; and that this is a full, true, complete and correct transcription of said proceedings.



JENIFER WEISMAN, CSR-6006
Notary Public,
Oakland County, Michigan.
My Commission expires: August 17, 2027

AMERICAN ARBITRATION ASSOCIATION

INTERNATIONAL CENTRE FOR DISPUTE RESOLUTION

COMMERCIAL ARBITRATION RULES

BOSCH AUTOMOTIVE SERVICE
SOLUTIONS, INC.,

Claimant,

vs. Case No. 01-21-0016-2306

Arbitrator Thomas W. Cranmer

COLLISION SCIENCES, INC.,

Respondent.

VOL II

ARBITRATION HEARING

Taken at 150 W. Jefferson Avenue, #2500,
Detroit, Michigan
Commencing at 9:00 a.m.,
Tuesday, September 10, 2024,
Before Jenifer Weisman, CSR-6006.

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EXHIBITS

(Exhibits marked and retained by counsel.)

Tuesday, September 10, 2024

9:00 a.m.

THE ARBITRATOR: Good morning. Any preliminary matters we need to deal with?

MR. ZELLER: No.

MR. MONSMA: No.

THE ARBITRATOR: Tim, it's your cross-examination.

EXAMINATION

BY MR. MONSMA:

Q. Good morning. You understand you're still under oath?

A. Yes, I understand.

Q. You might remember me from your deposition a couple months ago, but I represent Collision Sciences in this case. You understand that, I assume?

A. I understand.

Q. Okay. Let me ask you a few questions about what you did in this case and maybe more importantly what you didn't do.

Before I do that, let me kind of set the table here. Is it your understanding that CSI has three distinct products, software products?

A. It's my understanding they provided -- produced to me three different software repositories. I'm not sure

if that's --

Q. I want to make sure we're all talking about the same universe of software issues, for lack of a better word.

So the first piece of software is the CrashScan app, right?

A. I'm aware of that, yes.

Q. And you're aware of the CDR-Replay tool; that's something different than CrashScan, right?

A. Correct.

Q. You're aware of the Amazon Web Service or AWS server, right?

A. Yes.

Q. Okay. So that's kind of the universe --

A. But it's multiple servers.

Q. Fair enough. But those are the different components that you looked at to varying degrees in this case, correct?

A. The different components I looked at to varying degrees were the audit laptop, the source code repositories that were related to the CrashScan app, and the Amazon Web Services servers.

Q. But my summary of CSI's offerings, for lack of a better word, is accurate, right; there's those three components?

Q. And that was supposedly to understand the Bosch CDR software?
A. Understand the messages coming out of the Bosch CDR software.
Q. And that conclusion is based on your review of that April 2018 video, right?
A. That's correct; along with the Summary of Code and all the other materials.
Q. BUSMASTER is a software tool designed specifically for that purpose, right?
A. Yes.
Q. To observe?
A. My understanding is to listen to messages sent across the BUSMASTER such as the CAN bus for automobiles.
Q. That's the reason that that software exists, correct?
A. That's my understanding of how it --
Q. Is it also your understanding that Bosch created BUSMASTER?
A. It's my understanding that it's a Bosch tool. I don't remember. There were some odd things about its creation.
Q. It's free, isn't it?
A. It's my understanding it's open source, so it should be free.
Q. Let me ask you about some of your conclusions in this

case. When you examined CSI's systems, it did not appear that Bosch's software had been broken down or disassembled or cracked in some way such that the source code could have been extracted, is that right?

A. From the evidence I reviewed, that is correct.

Q. And you also saw no evidence that CSI copied Bosch's code, correct?

A. I didn't see evidence that they had access to the code in order to copy it.

Q. So the answer is no?

A. I'm agreeing with you. I don't remember whether it was a yes or a no.

Q. You can't say for certain in 2024 whether the CDR-Replay requires the Bosch tool to function, can you?

A. In 2024, I can't say anything for certain. Again, I work in more likely than not.

Q. And your analysis did not uncover any evidence that CSI transferred the Bosch software to any third party, did it?

A. Let me take a moment to parse that. That CSI transferred to a third party, the Bosch software. I think I've seen the other way around through StreetDelivery, but I have not seen CSI transferred the Bosch software.

Q. I don't want to beat a dead horse, but I think it's an important issue: The CrashScan app is different than CDR-Replay, isn't it?
A. That's correct.
Q. The CrashScan app scans vehicles, processes the information from those vehicles, and generates reports for customers, right?
A. That's correct.
Q. Although you didn't spend as much time analyzing how CrashScan works, you were able to determine that it does not incorporate the Bosch CDR tool, correct?
A. That was the purpose of the initial audit.
Q. And CrashScan can be used without the Bosch CDR tool, can't it?
A. CrashScan can be used without the Bosch CDR-Replay tool.
Q. I'm sorry, I'm not talking about the CDR-Replay tool; I'm talking about Bosch's tool. CrashScan can operate --
A. Yes, it can run without Bosch's software.
Q. Thank you. I know you see this one coming because you talked about it yesterday, but there are lots of different definitions of reverse engineering in your opinion, right?
A. That's correct.

Q. Do you dispute it was 85,000 rows?
A. Yeah, did we get that from somewhere?
Q. Yesterday, Mr. HelfinSiegel testified that when he reviewed that data, there was 85 or 89,000 entries.
A. I think he said 89,000.
Q. So does that represent --
A. I do not dispute.
Q. Does that represent 89,000 times somebody used the CrashScan application?
A. That is not how that works, no.
Q. Oh, I thought you just said that it's data extracted from your mobile app?
A. I can break it down for you. So internally, the app actually runs with multiple steps of the process. Our app would contract EDR data, which is called crash data; it would extract emissions data for emissions testing; it can also extract diagnostic data. Each of those steps will actually create a row in the database. And our clients are free to run as many times as they want on a vehicle. If someone wants to run a scan three times, that might result in nine distinct rows, but they all correspond to the same vehicle. So it's not okay to say 89,000 rows would represent 89,000 unique vehicles.
Q. What's your understanding of the term reverse

engineering?
A. I believe I provided that definition during my deposition as figuring out how something works.
Q. At the time of the video that we saw, the CDR-Replay depends on the Bosch tool to operate, right?
A. No.
Q. No?
A. It works with the Bosch software; it doesn't depend on the Bosch software.
Q. Well, what's the purpose of CDR-Replay?
A. So CDR-Replay is a virtual module for a vehicle simulator. Its purpose is to receive vehicle messages and transmit vehicle messages based on the received requests.
Q. So it could be set up to receive and transmit to anything, is that what you're saying?
A. Yes.
Q. You guys just happen to run it with the Bosch software?
A. In that video, correct.
Q. Isn't it true that that's how you use CDR-Replay always?
A. That's not true.
Q. Do you remember in your deposition I was asking you about CDR-Replay a bunch of times that you mentioned

November 11, 2021?
A. Can you repeat the date?
Q. From July 19th, 2019 to November 11th, 2021.
A. Okay.
Q. 2,500, about 2,500 Bosch reports.
A. Okay.
Q. Does that surprise you?
A. Not really, no.
Q. But that is -- to save a Bosch report on your system is to use the CDR-Replay from a CrashScan app, is that right?
A. Can you rephrase the question?
Q. Sure. For Collison Sciences to have a Bosch report on its system, that involved using CDR-Replay to produce the report?
A. Correct.
Q. Is it correct that your CrashScan application of -- has a lot of automated e-mails as part of the system, in general?
A. Sure, we can go with that.
Q. I think some of the e-mails are a notice when somebody scans, they get an e-mail that a report is available, right?
A. Correct.
Q. You've also put into your system automatic e-mails for

certain vehicles that may have issues, is that right? If you'd rather look at a document, we can do that.

A. Sure, let's do that.

Q. Let's go to 76.

A. Yep.

Q. So Exhibit 76 --

THE ARBITRATOR: Give us just one minute.

MR. ZELLER: Sure.

THE ARBITRATOR: Thanks.

BY MR. ZELLER:

Q. Exhibit 76 is an automatic e-mail from your CrashScan service, is that right?

A. Yes.

Q. If I have characterized that wrong, feel free to let me know.

This particular e-mail is -- has a subject line of uncoded Subaru -- Alert - Uncoded (sic) Subaru Vehicle Model Scanned, correct?

A. Incorrect.

Q. Oh, I'm sorry.

A. Undecoded.

Q. Okay, Undecoded. So what that means is that somebody used the CrashScan application to a Subaru vehicle that automatically produced this e-mail, is that right?

A. Correct.
Q. And it goes to you, right?
A. Correct.
Q. Now, the e-mail, in the body, says this is a Subaru that uses cable 614 or 616. Use CDR-Replay to decode information, is that correct?
A. Correct.
Q. So if you get this e-mail, then you run CDR-Replay to view a Bosch report, correct?
A. It's a message that I coded it to myself that I should consider using the CDR-Replay. I don't know if I did in this case.
Q. So it's just to consider it?
A. It's a reminder; it's an alert.
Q. Can you look at Exhibit 77? This is another automatic e-mail that the system sends, is that right?
A. Yes.
Q. And this one in particular flags the fact that the scan was for a vehicle that uses FCA cables 387 and 821, correct?
A. Correct.
Q. It instructs you to check data decoding scheme with CDR-Replay, correct?
A. Correct.
Q. It also says the report has been placed under review.

That means you haven't released the report yet, correct?
A. Correct.
Q. The user can't access the report?
A. No, they cannot.
Q. You have to manually release report for the user to get it, is that right?
A. Correct.
Q. Let's go to Exhibit 82. Exhibit 82 is another automatic e-mail from the system, is that correct?
A. Correct.
Q. And Exhibit 82 is for a Mazda cable 831, is that right?
A. Yes.
Q. In particular, it instructs you to check data decoding scheme with CDR-Replay, correct?
A. Yes.
Q. Can you look at 86? Exhibit 86 is another automatic e-mail that the system sends to you, correct?
A. Yes.
Q. And this particular one is for a BMW cable 798 module, correct?
A. Yes.
Q. Now, again, this e-mail instructs you to check data decoding scheme with CDR-Replay, right?

A. Yes.
Q. And this one also has the report under review. So you have to go and manually release it to the customer?
A. Yes.
Q. Last one, 88.
A. Yes.
Q. All right. Exhibit 88 is also an automatic e-mail the system sends to you, correct?
A. Yes.
Q. This one is for a BMW. Unknown Software Version is the title, correct?
A. Yes.
Q. All right. This is complicated, but in essence, it's the response to a particular hexadecimal relationship, is that correct?
A. A response to a hexadecimal request.
Q. Okay. It's not what you expected it to be, is that --
A. It is not something that we have seen before.
Q. Oh, okay. Just so I'm clear, is Exhibit 88 unique in the sense it's not a preprogrammed -- it comes up with what your error code is, is that right?
A. I'm sorry, can you clarify the question?
Q. Well, you know what, I want you to clarify. You said it's something you hadn't seen before.
A. Right. It says the response to -- hold on, I'm going

to read it. So it's saying the response to that particular request is not among this list of software versions.

Q. Okay. Then the e-mail instructs you to check data decoding scheme with CDR-Replay, right?

A. Yes.

Q. So you need to check the Bosch report to make sure you're decoding it correctly?

A. I don't need to.

Q. Why not?

A. I could just release a report or I can delete the scan and tell the client we can't support a vehicle.

Q. I'm going to do one more. Exhibit 87.

A. Okay.

Q. 87 is another automatic e-mail the system sends to you, correct?

A. Correct.

Q. In this case, a Honda Accord was scanned and the e-mail has a subject of Honda Cable 825 Module Scanned, correct?

A. Yes.

Q. This e-mail instructs you to check data accuracy with CDR-Replay, correct?

A. Yes.

Q. Also to check if any new information is available,

A. Yes.
Q. Since you've got book 2, let's go to Exhibit 128. Exhibit 128 is your invoice dated April 20, 2020 to Collison Sciences, is that right?
A. Yes.
Q. And at page 2 and onward is the description of the work you did during that period, is that right?
A. During the period of April 1st to April 15th.
Q. Right. Now, under April 1st, the second to last paragraph states, replayed and checked a 2008 Toyota Tacoma scan. The Delta-v resolution was updated and then the report was released.

When you wrote replayed and checked, you meant that you used the CDR-Replay, correct?
A. Yes.
Q. And you produced a Bosch report?
A. Yes.
Q. And that's what you checked to update the Delta-v resolution, correct?
A. Yes.
Q. After you checked it, you released the Collison Sciences' report to the customer?
A. Correct.
Q. Can you go to page 4, top right corner. Sorry, from page 3, we're looking at April 3rd entries, right?

A. I can only say last year. I'm not going to be able to pinpoint when in time.
Q. Last year?
A. Correct.
Q. So wait, let me get this straight: It is a Chinese tool; is it software?
A. It's software and hardware.
Q. Okay. So back in 2000 when these invoices are, when you use the word replay --
A. Sorry, back in 2000?
Q. Sorry, 2020. Your invoices are 2020.
A. Okay.
Q. If you use the word replay and it's not a Hyundai or Kia, you were using the Bosch software, correct?
A. Most likely, yes.
Q. One more, let's go to Exhibit 73. Exhibit 73 is your invoice dated May 18th, 2020 for the first half of that month, May 2020, right?
A. Correct.
Q. All right. Page 9 under May 12th.
A. Okay.
Q. All right. Fourth paragraph, you wrote, got a 2012 Dodge Grand Caravan scanned that had some weird decoding issue. Did a CDR-Replay and the report came out clean. Checked the Python source code and

corrected an error in the Delta-v calculation code.

Now, that means that you took the scan that somebody did for the 2012 Dodge Grand Caravan using CrashScan, took that data and ran it through CDR-Replay to produce a Bosch report, correct?

A. Yes.

Q. And in your view, the Bosch report looked fine, correct? You wrote it came out clean.

A. Yeah, I don't recall what I meant by that.

Q. Okay. But in any event, you went to Collison Sciences' Python code and made corrections, correct?

A. Yes.

Q. Mr. Hsu, when is the last time you generated a Bosch report?

A. Last Friday.

Q. What version of Bosch software are you using?

A. I don't know for sure.

Q. What was the context that you used the Bosch software last Friday?

A. I think I just had to check something to see what Bosch -- get a second opinion to see what they have to say.

Q. Was it in response to a -- somebody using the CrashScan application?

A. Most likely, yes.

Q. But like you said, that's not what you did --
A. Correct.
Q. -- right?
A. Correct.
Q. You actually went out and hired several different software engineers to help with this project, right?
A. Correct.
Q. So can you look at 135? When you hired these software engineers, your specific instructions were to reverse engineer the Bosch tool, right?
A. I don't recall if those were my instructions.
Q. All right. Looking at Exhibit 135, it is an e-mail, it says from Collision Sciences, but it's from you, correct?
A. Correct.
Q. And to CP Karpagam, I believe you mentioned during the deposition that's a woman?
A. Correct.
Q. And a software engineer, correct?
A. I don't recall her credentials actually.
Q. A developer?
A. I believe so.
Q. And it's a series of e-mails and I want to direct your attention to the second page. There's an e-mail on April 27, 2017 and you wrote, hi Karpagam, please take

all the time you need with the NDA getting -- including getting legal advice. And specifically you wrote, the opportunity I'm offering to start is an independent contractor role for software review and development, reverse engineering, if required, to get the project to a demo level, is that right?

A. I wrote that, that's correct.

Q. So if required, you were going to expect her to reverse engineer the Bosch software?

A. I said if required.

Q. That's how I said it.

A. I didn't say the Bosch software.

Q. I'm sorry, this is 43, and that might be in book 1. Actually, it's Exhibit 42, it's the one before it, sorry.

Exhibit 42 is an e-mail from you to Brian Hsu, September 12, 2017, is that correct?

A. Yes.

Q. You wrote to him, can you please forward me your resume so we have it on file? And next you wrote, to recap our call, in point 4, you said, to think on, can we automate the reverse engineering of many vehicles? It's unlikely, but I'm curious if it's possible. You wrote that, right?

A. Yes.

Q. And you were talking about reverse engineering the Bosch software for a lot of vehicles, is that right?
A. Not necessarily. I mean, for example, there are a lot of PDF reports in the public, so they have the hex data and numerical data. So if you can figure out artificial intelligence that can reverse engineer the translation -- I was conceptualizing a lot on different ideas.
Q. Okay. Then look at Exhibit 43 then. Exhibit 43 is another e-mail from you to Brian Hsu and Renan Pedrosa, who we mentioned earlier, September 25th, 2017. I'm going to start with the e-mail that starts September 25th, a little bit further down. Again from you, and you wrote in the second line, I guess, also please don't give up too quickly on the firmware. We may try the other software Firm Walker. The last thing you wrote was, Renan, please share any progress ideas on the firmware. You mentioned you had some other software reverse engineering ideas.

You were definitely talking about reverse engineering software with your developers at that time, correct?
A. Yes.
Q. And then at the top you forwarded a Google link for the search term reverse engineering encrypted

firmware, is that right?
A. Yes.
Q. And you forwarded that to your developers?
A. Yes.
Q. Can you look at exhibit 46? This is another e-mail from Brian to you and CC'ing Renan, October 12th, 2017, and it's a chain that -- the second e-mail in the chain is October 12th from you. And you wrote on the third line, I will send some info I've gathered on the Toyota CT algorithm which may help but also may need to be reversed engineered further also.

You wrote that, right?
A. Yes.
Q. It's a reference to reverse engineering the particular Toyota security encryption for their EDR data, right?
A. I don't know the context in which I said this. I may have found some information online. And when I say may also be need to be reverse engineered, I don't know; conceptual. I don't know what I was referring to.
Q. All right.
A. There's a lot of information in the automotive aftermarket online to find about how to communicate to modules. There's an airbag crash data reset community; everyone wants to delete crash data, so

Bosch licenses dated January 26, 2018, is that correct?

A. Correct.

Q. And that e-mail says, Dear Jason Bayley, thank you for your recent purchase of CDR software subscription.

You agree that you purchased a CDR software subscription on or about January 26th, 2018?

A. Correct.

Q. This e-mail included the activation certificate it says in the fourth paragraph.

A. Yes.

Q. And you forwarded that to Brian, correct?

A. Yes.

Q. And you forwarded it to him to install and activate the software?

A. Yes.

Q. Then we'll go to Exhibit 144. Exhibit 144 is an e-mail from you to Brian and you're forwarding to him the e-mail from Bosch licenses. Do you see that?

A. Yes.

Q. The date of e-mail from Bosch licenses is July 9th, 2019.

A. Yes.

Q. Do you see that?

A. Yes.

Q. And the attachments in your e-mail to Brian, it's in the heading, the attachment is CDR19_1_1year_some numbers.CTF (sic). The e-mail says it attaches the activation certificate. That is the activation certificate, correct?
A. Correct.
Q. And you forwarded it to Brian in order for him to install it on the his computer, his laptop, and activate it, correct?
A. Yes.
Q. And this represents the fact that you purchased it -- a license on or about July 9th, right?
A. Yes.
Q. All right. 170, please. Exhibit 170 is, again, an e-mail from you to Brian, January 26th, 2018, forwarding an e-mail from Bosch licenses in which you purchased a Bosch CDR software subscription, is that correct?
A. Yes.
Q. And this was for version 17.6 of the Bosch software and you forwarded the activation certificate, correct?
A. Correct.
Q. And you intended for Brian to install the software and activate it using the certificate, right?
A. Correct.

would cost to have them get the Bosch software?
A. No, that's the cost of having an engineer drive out to a car at 200, 300 an hour to use the Bosch tool or a similar EDR tool and then collect the data and write up an engineering report on the data; it's contextualizing the data. I see comparable costs and engineering fees at the bottom.
Q. Okay. Go to Exhibit 140. That's an e-mail from you to Tom Walsh, this time his full name is there, December 7, 2018, and subject is Wawanesa --
A. Yes.
Q. -- follow-up, suggestions. You're writing him to thank him for his critical feedback, right?
A. Correct.
Q. So you had a meeting with Wawanesa, they provided feedback to you, and -- or I should say Tom Walsh provided feedback of your meeting with them to you, is that right?
A. Say that again.
Q. You had a meeting with Wawanesa?
A. Yes.
Q. To talk about your CrashScan application?
A. Yes.
Q. And actually, if you go in the chain, on the next page you wrote to Tom and Chad with a suggested response

back to Wawanesa after your meeting?
A. Right.
Q. One of the things you wrote in your proposed response back was under the heading of reverse engineering copyright. Do you see that at the bottom?
A. Yes.
Q. And it goes on to the next page at the top. You wrote, note there is case law to defend the reverse engineering manner in which we developed our diagnostic solution. You wrote that, right?
A. Yes.
Q. So it's fair to say that the issue of reverse engineering was raised in your meetings with Wawanesa?
A. Yes.
Q. And you were trying to come up with defenses to the actions you took in developing the product, is that right?
A. Yes.
Q. You wrote in the second sentence, further, the EULA of the Bosch tool does not prohibit reverse engineering, is that right?
A. Yes.
Q. So at least at that time you were aware of the EULAs that controlled the software, is that right?
A. Yes.

Q. One of the other attachments is the SIU proposal cost benefit analysis. Do you see that? I was looking at the e-mail first, the attachment there. The title of the document was listed.
A. Okay.
Q. Now, I just want to go over this document here. You sent this to a lot of different people, including different insurers.
A. I wouldn't say a lot. I don't recall. A few.
Q. You sent it out and you sent it out in a --
A. I think it was created for one specific client and I may have shared it after with one or two clients. I don't recall how many.
Q. Okay. So it's Bates number 1636 at the bottom, if you want to go to the strategic business proposal.

MR. MONSMA: Which exhibit are you on?

MR. ZELLER: Still in 140. It's big. The Bates number at the bottom is 1636. 1635 is where it starts.

BY MR. ZELLER:
Q. Just the title at 1635, which is what you're talking about when we said EDR cost benefit analysis, has the title of Strategic Business Proposal; yes?
A. Correct.

MR. MONSMA: Steve, I'm sorry, I'm not

trying to trip things up; you're at Exhibit 140?

MR. ZELLER: 140, it's after the Bosch report.

MR. MONSMA: Bates are all 52-something.

MR. ZELLER: The last four digits are 1636.

MR. MONSMA: Got it.

BY MR. ZELLER:

Q. If you want to go two pages forward, the title is Extracting Maximum Value From Black Box Data and Solutions, 1.0, right?

A. Yes.

Q. The intro is a cost-benefit analysis of Crash Data Retrieval analysis and important solutions for passenger vehicle event data recorder, is that right?

A. Okay.

Q. On the second -- the next page, at the top you write -- you wrote, the Collision Sciences' solution can facilitate immense savings for an insurer, is that correct?

A. Correct.

Q. And even -- sorry, the next sentence you wrote, even as a direct replacement for the Bosch tool for 50 SIU users, the upfront cost of the Collision Sciences' solution is approximately $460,000 cheaper upfront and estimated to be $500,000 cheaper per year when

considering the true human resource costs involved with proper data analysis and reporting. Do you see that?

A. Yes.

Q. Part of what you're referring to there is the Bosch tool, right; because you say as a direct replacement for the Bosch tool?

A. Yes.

Q. Okay. And on the next page under the heading Collision Sciences' Hardware Solutions Software Provides Value to SIU or Active Bosch EDU Users. Do you see that?

A. Yes.

Q. You wrote in the first paragraph there that Collision Sciences' hardware and software solutions could be a replacement for the Bosch tool, but could also be used as a complementary tool, right?

A. Yes.

Q. Because it can be either, it's certainly -- you were marketing it as that it could be a replacement?

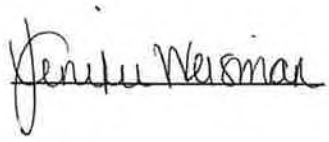
A. Right, that's correct. Within context of a very limited set of small crash data, it could test if crash data was stored or not. So in some cases it could be a replacement, but not in all use cases.

Q. This is off topic, but it's in the documents, so I'm

CERTIFICATE OF REPORTER

STATE OF MICHIGAN)
) SS
COUNTY OF OAKLAND)

I, JENIFER WEISMAN, hereby certify that I reported stenographically the foregoing proceedings and testimony under oath at the time and place hereinbefore set forth; that thereafter the same was reduced to computer transcription under my supervision; and that this is a full, true, complete and correct transcription of said proceedings.

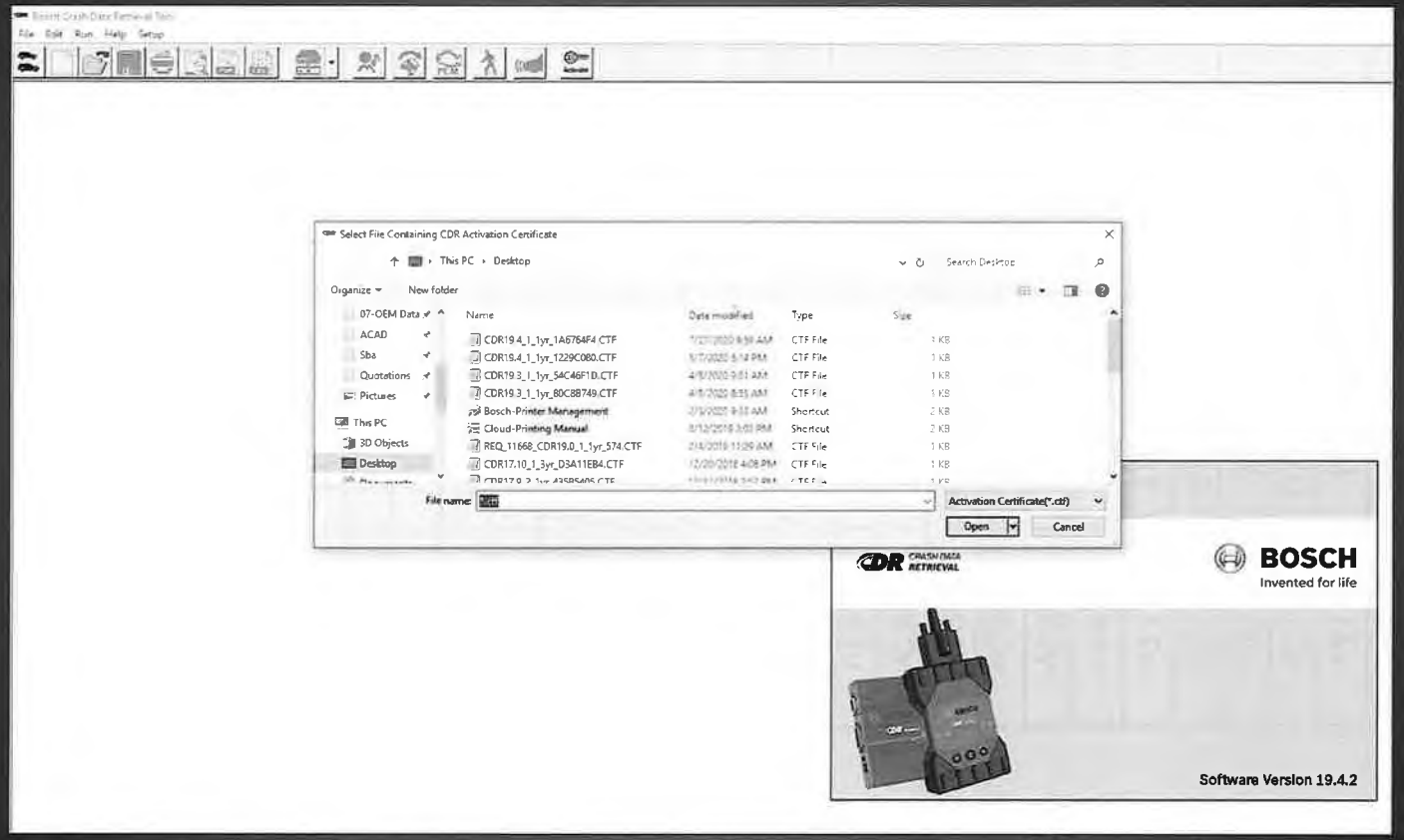


JENIFER WEISMAN, CSR-6006
Notary Public,
Oakland County, Michigan.
My Commission expires: August 17, 2027

Bosch CDR Version	Date of Release	EULA Version
v23.0	10/7/2022	19.0 - 21.5
v21.5	4/8/2022	19.0 - 21.5
v21.4	1/5/2022	19.0 - 21.5
v21.3	10/28/2021	19.0 - 21.5
v21.2	8/3/2021	19.0 - 21.5
v21.1	5/14/2021	19.0 - 21.5
v21.0	1/21/2021	19.0 - 21.5
v19.6	12/1/2020	19.0 - 21.5
v19.5	8/13/2020	19.0 - 21.5
v19.4	5/7/2020	19.0 - 21.5
v19.3	12/23/2019	19.0 - 21.5
v19.2	12/6/2019	19.0 - 21.5
v19.1	9/20/2019	19.0 - 21.5
v19.0	6/6/2019	19.0 - 21.5
v18.0	2/20/2019	17.8 - 18.1
v17.10	12/20/2018	17.8 - 18.1
v17.9	9/18/2018	17.8 - 18.1
v17.8	7/31/2018	17.8 - 18.1
v17.7	3/19/2018	17.3 - 17.7
v17.6	12/22/2017	17.3 - 17.7
v17.5	10/17/2017	17.3 - 17.7
v17.4	6/15/2017	17.3 - 17.7
v17.3	4/11/2017	17.3 - 17.7
v17.2	1/22/2017	17.3 - 17.7
v17.1	11/2/2016	3.8 - 17.0
v17.0	8/23/2016	3.8 - 17.0
v16.6	5/23/2016	3.8 - 17.0
v16.5	3/18/2016	3.8 - 17.0
v16.4	12/17/2015	3.8 - 17.0
v16.3	11/20/2015	3.8 - 17.0
v16.2	8/10/2015	3.8 - 17.0
v16.1	5/25/2015	3.8 - 17.0
v16.0	3/8/2015	3.8 - 17.0

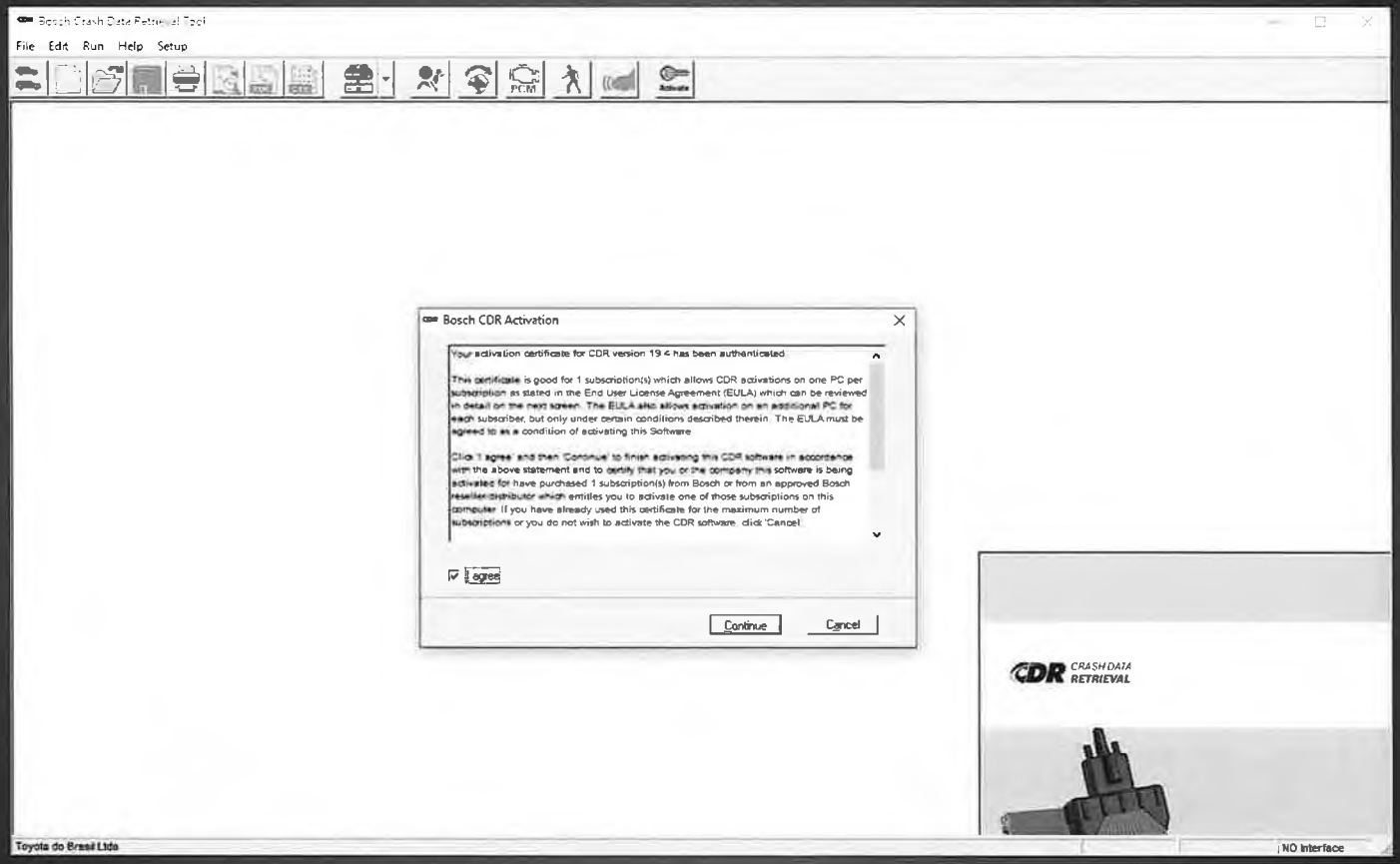
Hrg DEMO
1

Bosch CDR Tool Software Activation Screens: Installing certificate file

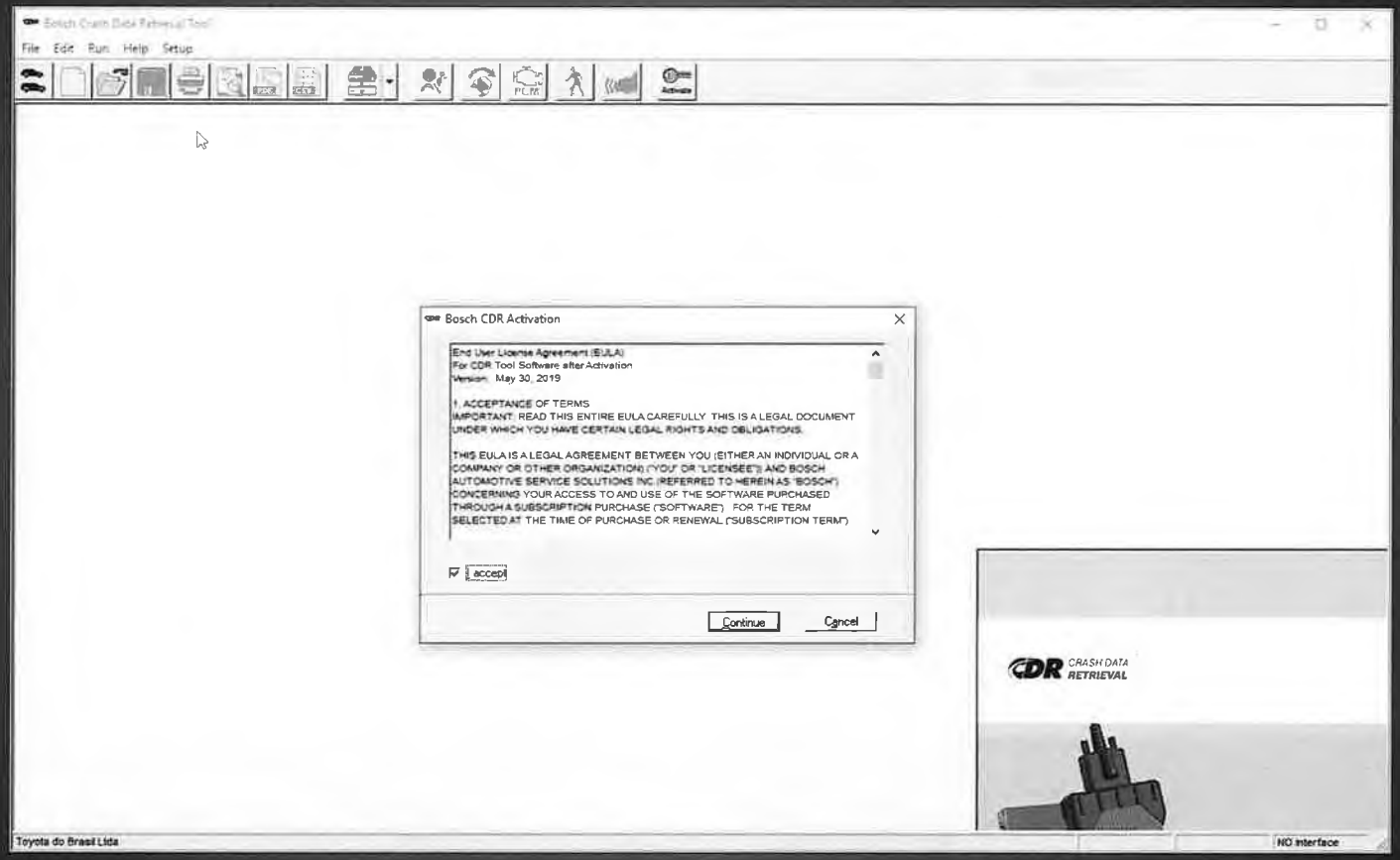


Hrg DEMO
2

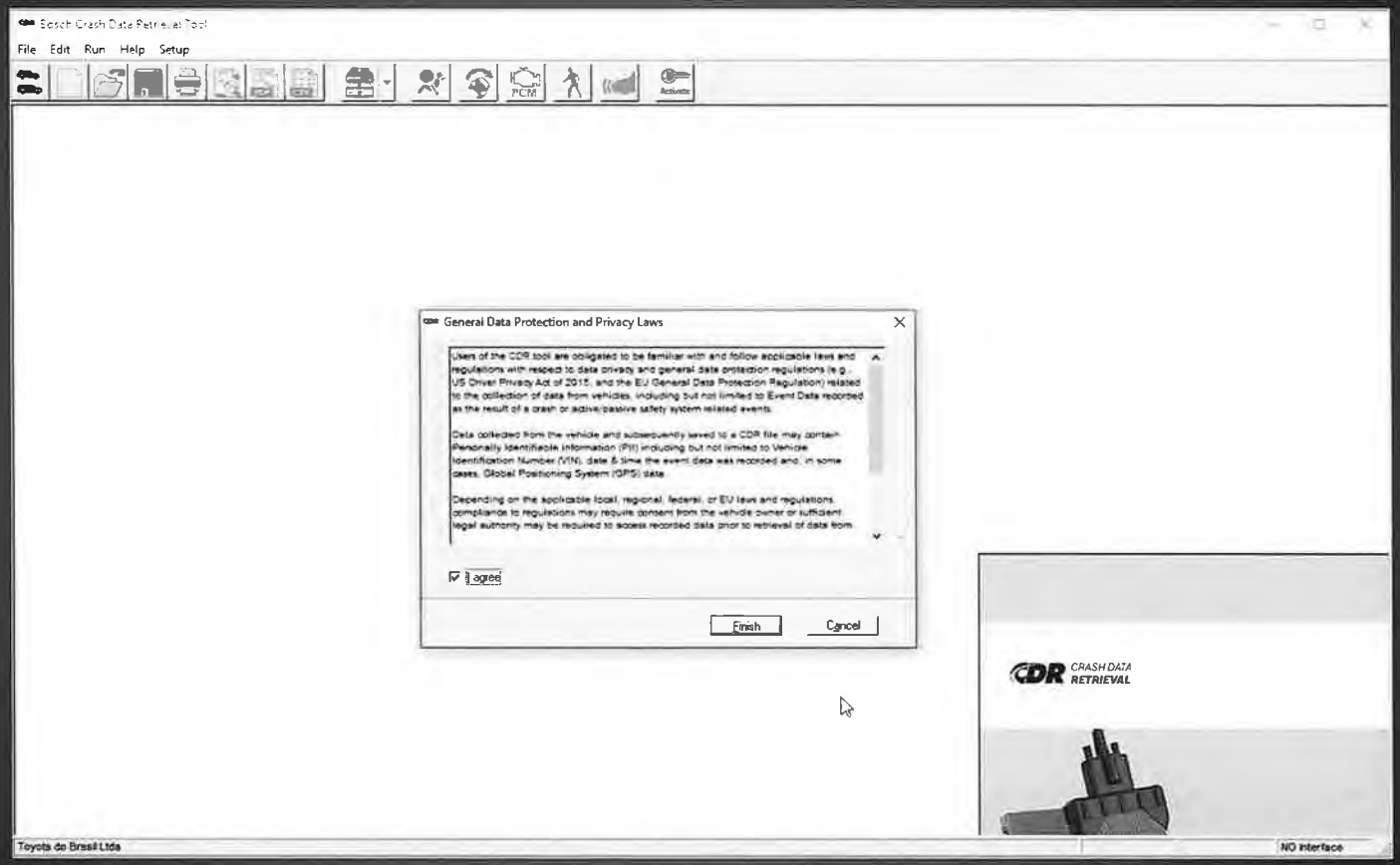
Bosch CDR Tool Software Activation Screens: Certificate authenticated; “I agree” to continue



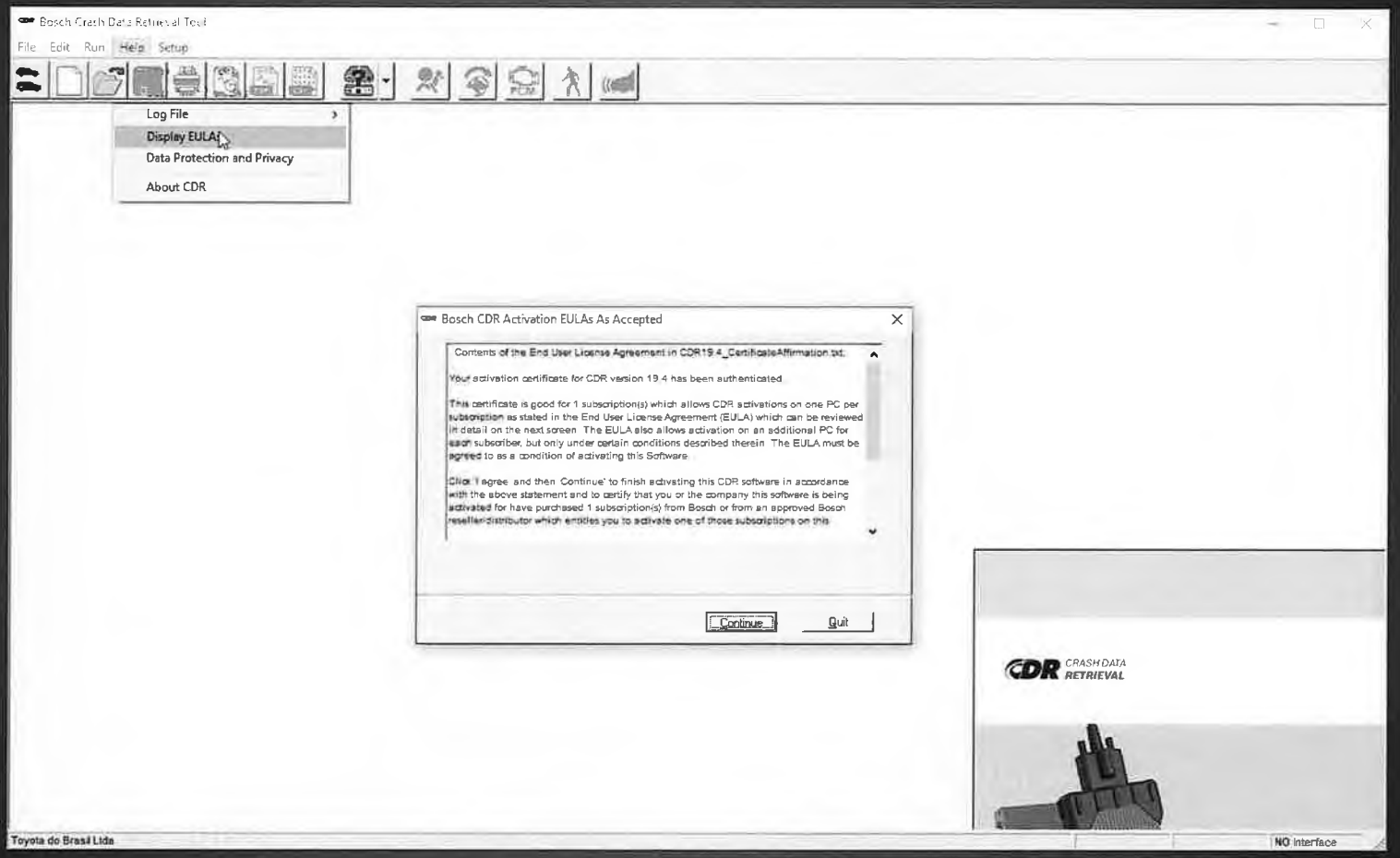
Bosch CDR Tool Software Activation Screens:
EULA presented; “I accept” to continue.



Bosch CDR Tool Software Activation Screens:
Date protection and privacy law compliance; “I agree to continue.



EULA available after Activation.



Presentation Regarding April 3, 2018 Video

Hearing Exhibit 37

Hrg DEMO
3

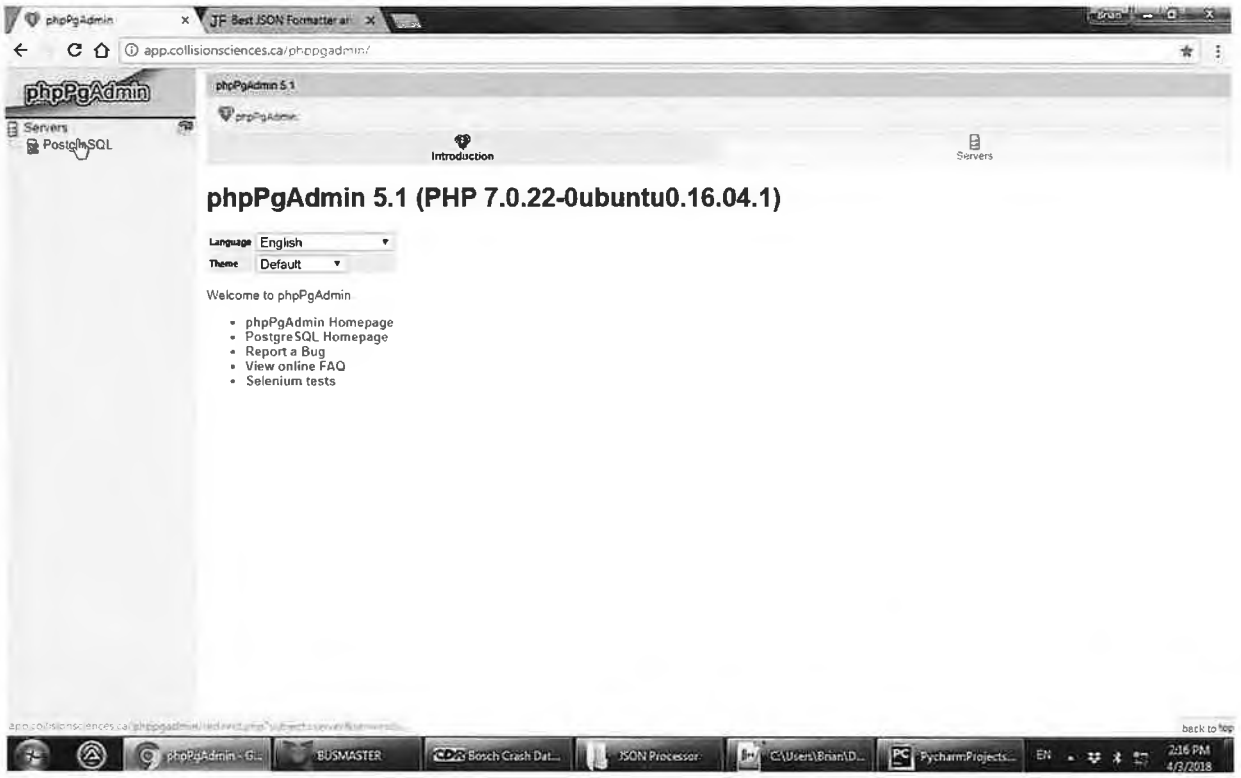
Audit Finding

Search for the term "CDR Replay" revealed a video present on the Audit Laptop that appears to demonstrate the CSI "CDR Replay" tool.

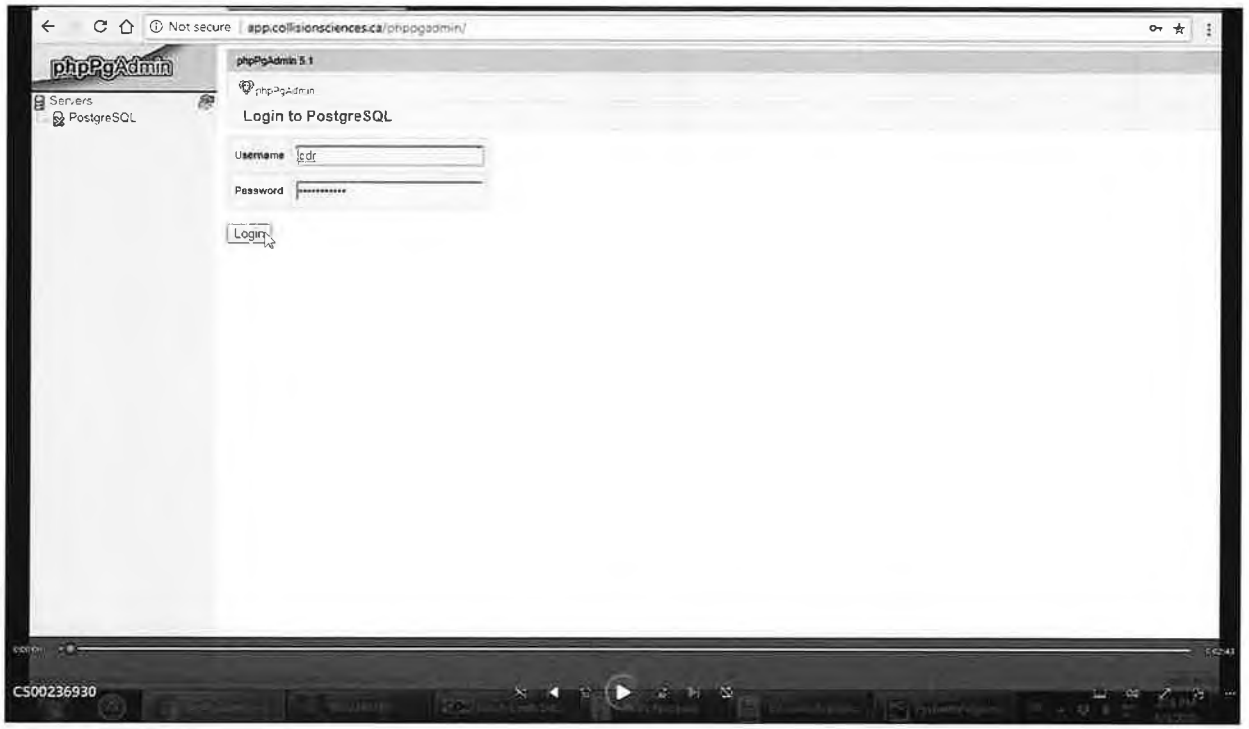
This file was later produced as CS00236930.WMV

CS00236930.WMV

(April 3, 2018 Video)

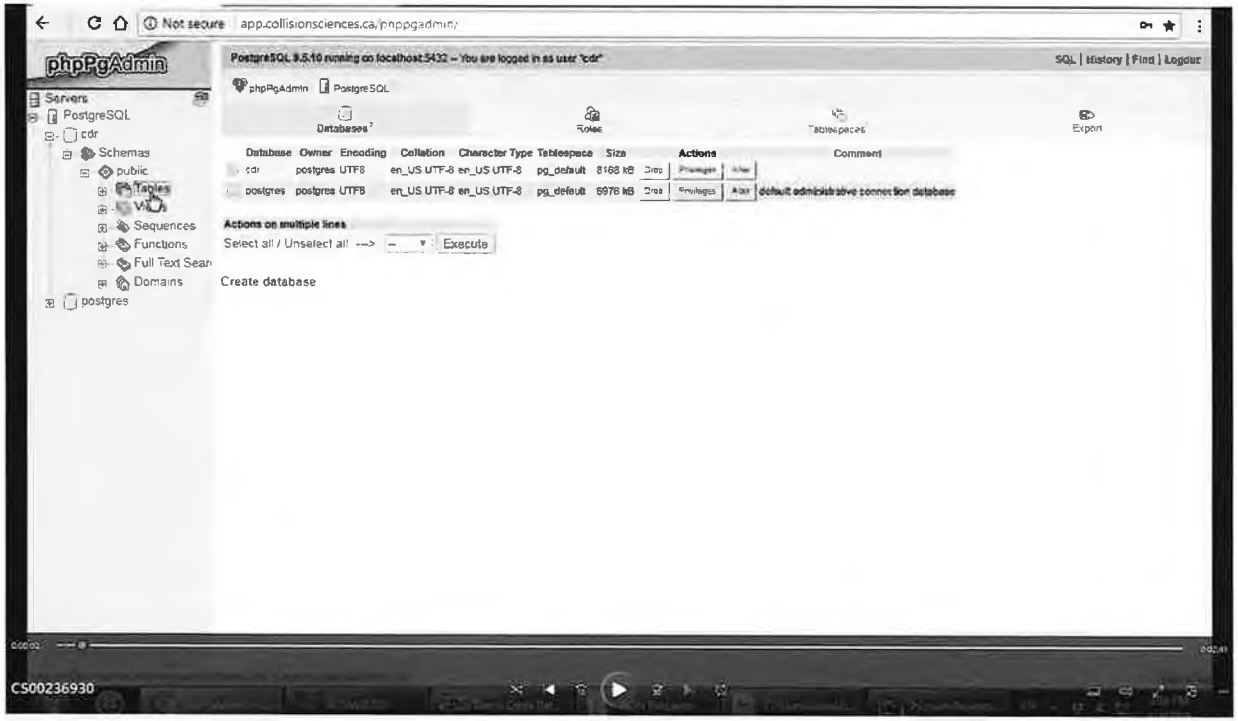


Log-in



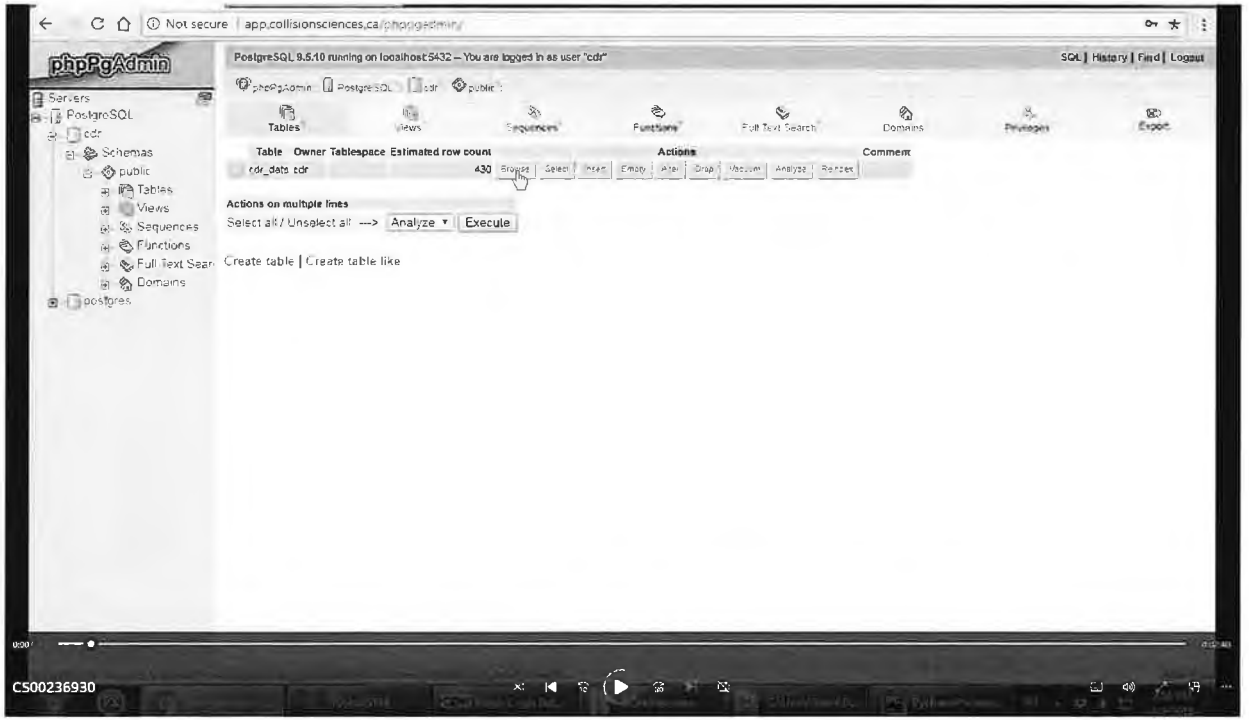
CS00236930.WMV

Database View



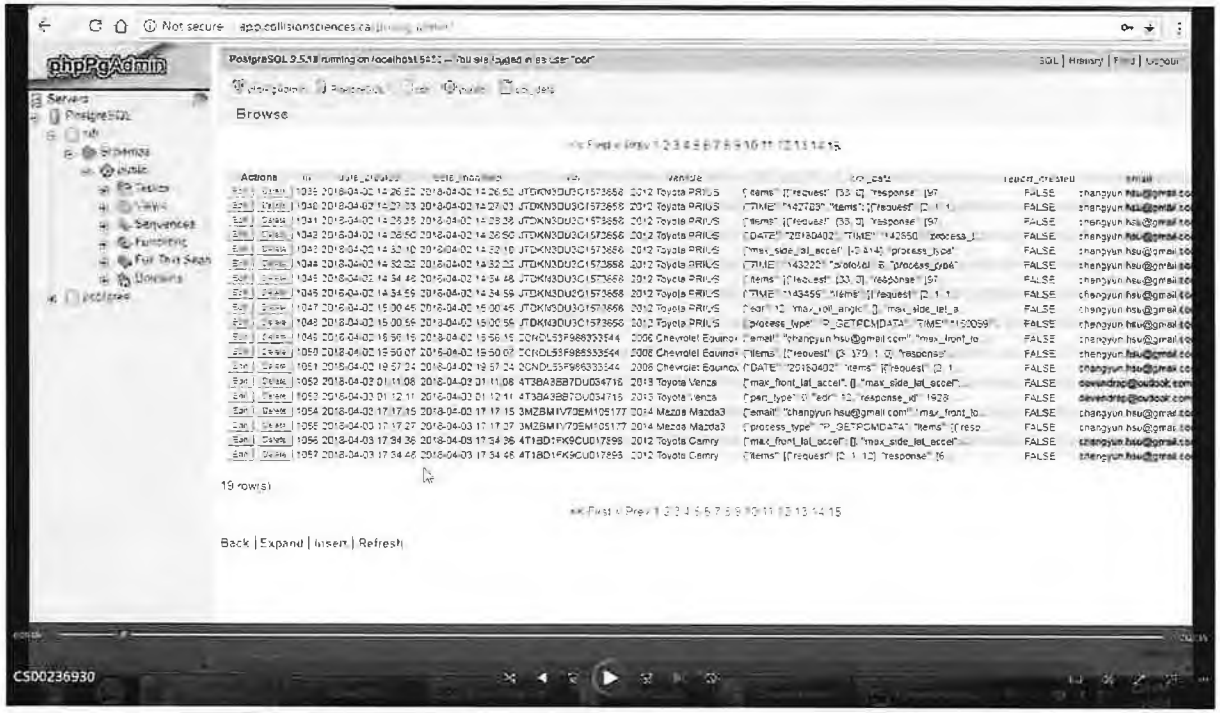
CS00236930.WMV

cdr_data table



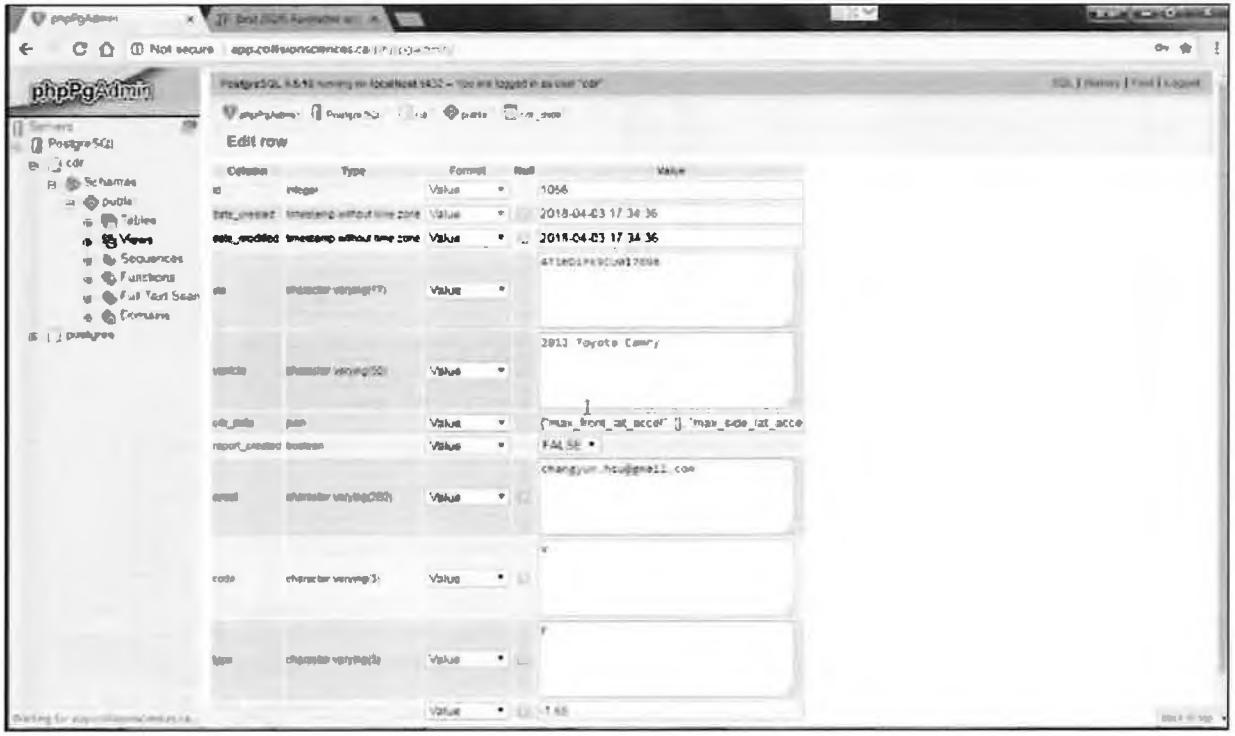
CS00236930.WMV

Browsing cdr_data

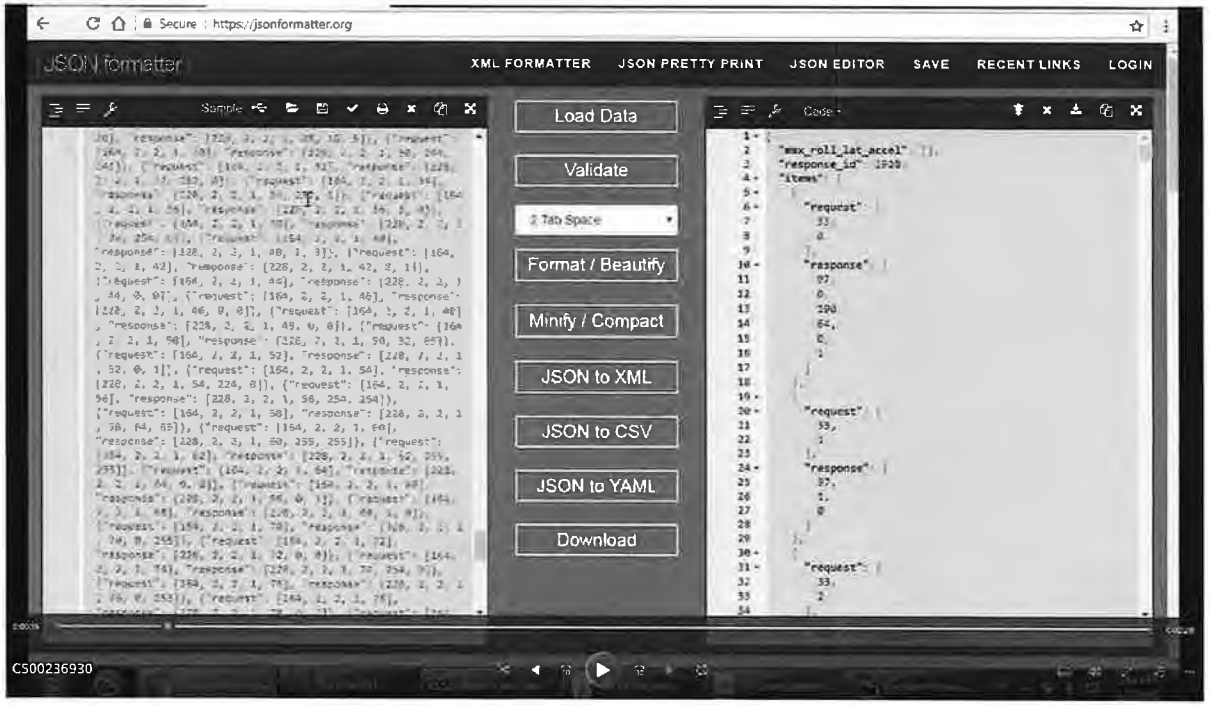


CS00236930.WMV

Log-in and “cdr_data” field

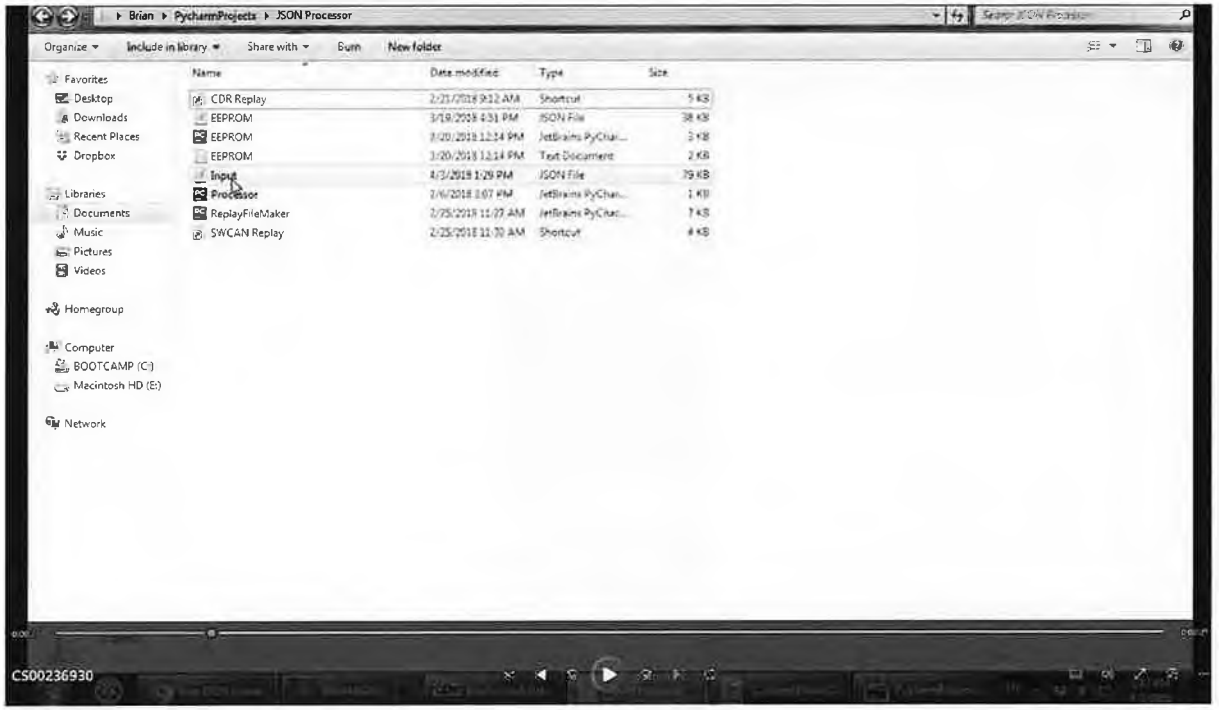


JSON formatter



CS00236930.WMV

JSON Input



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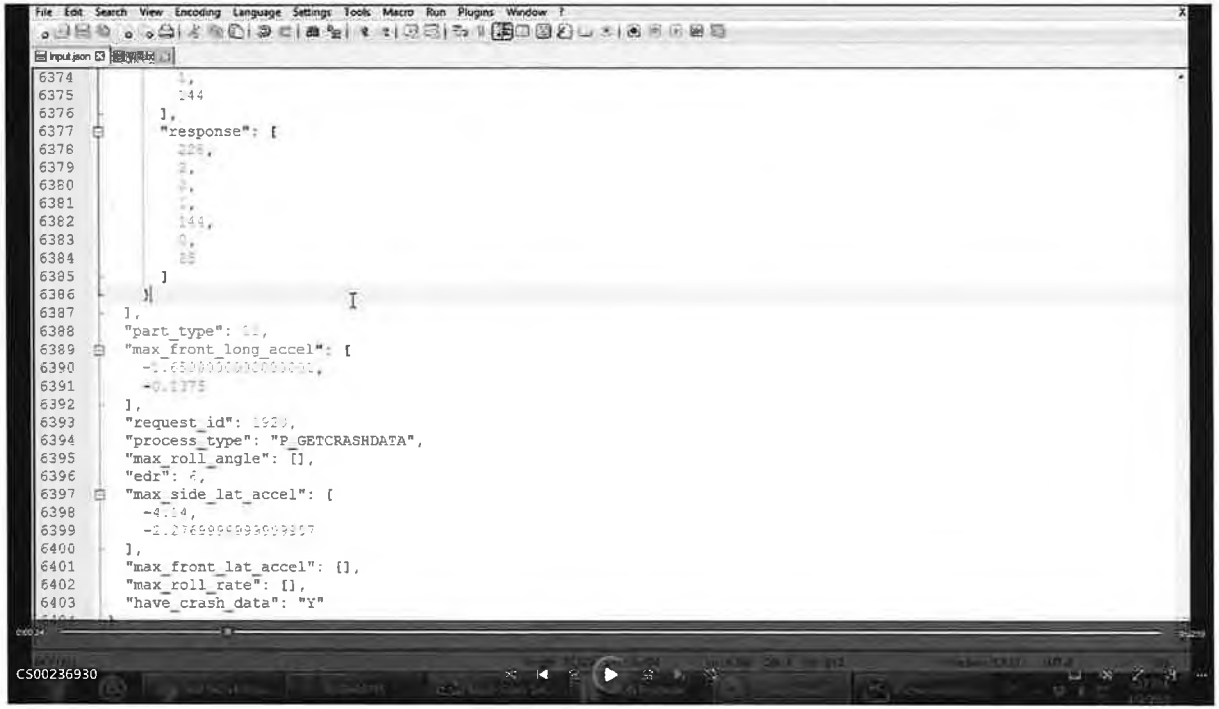
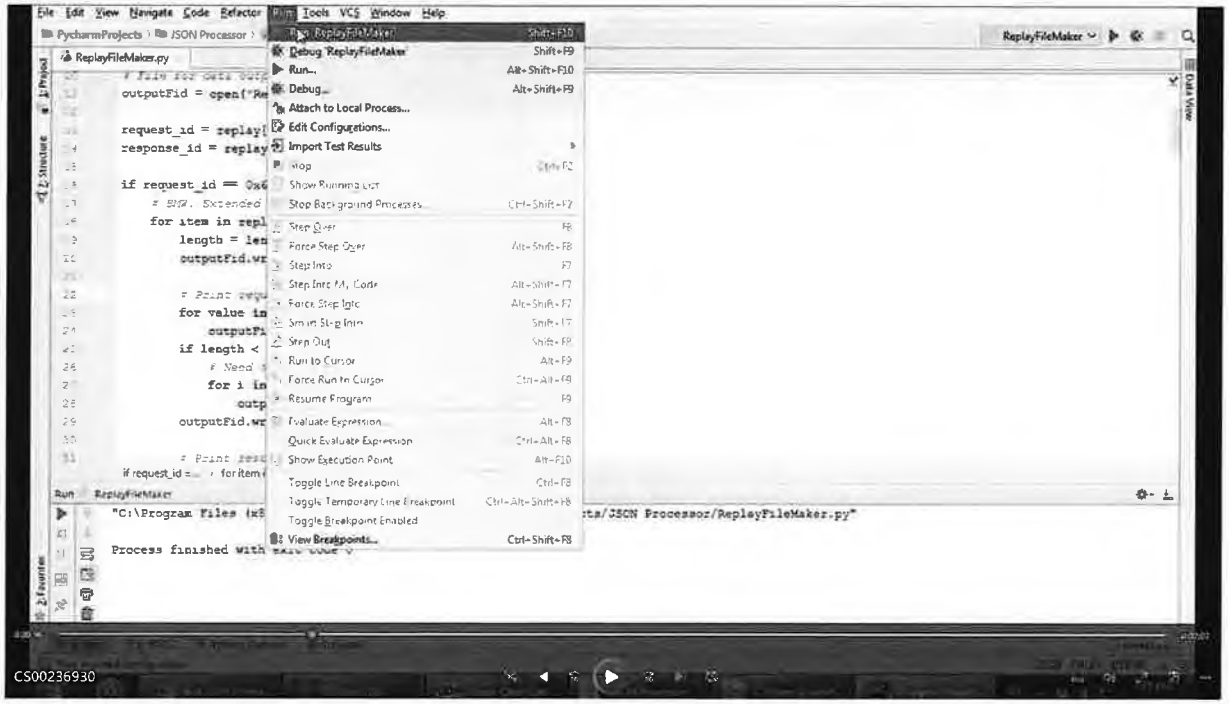
Input.json



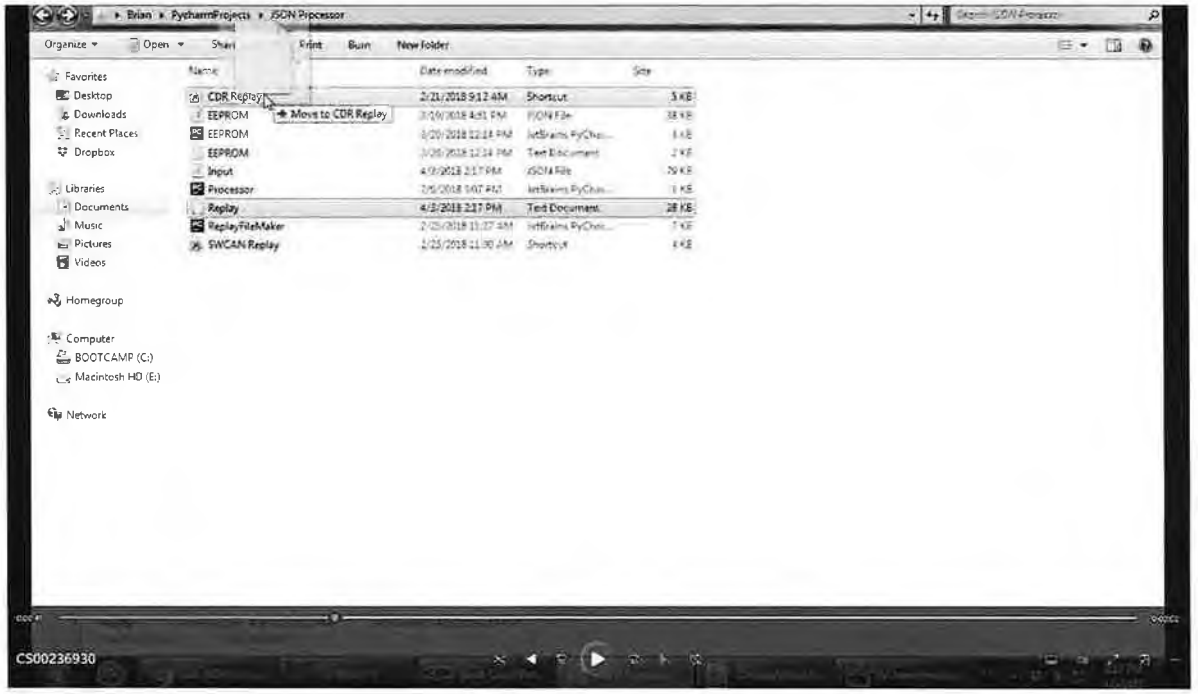
CS00236930.WMV

Run ReplayFileMaker



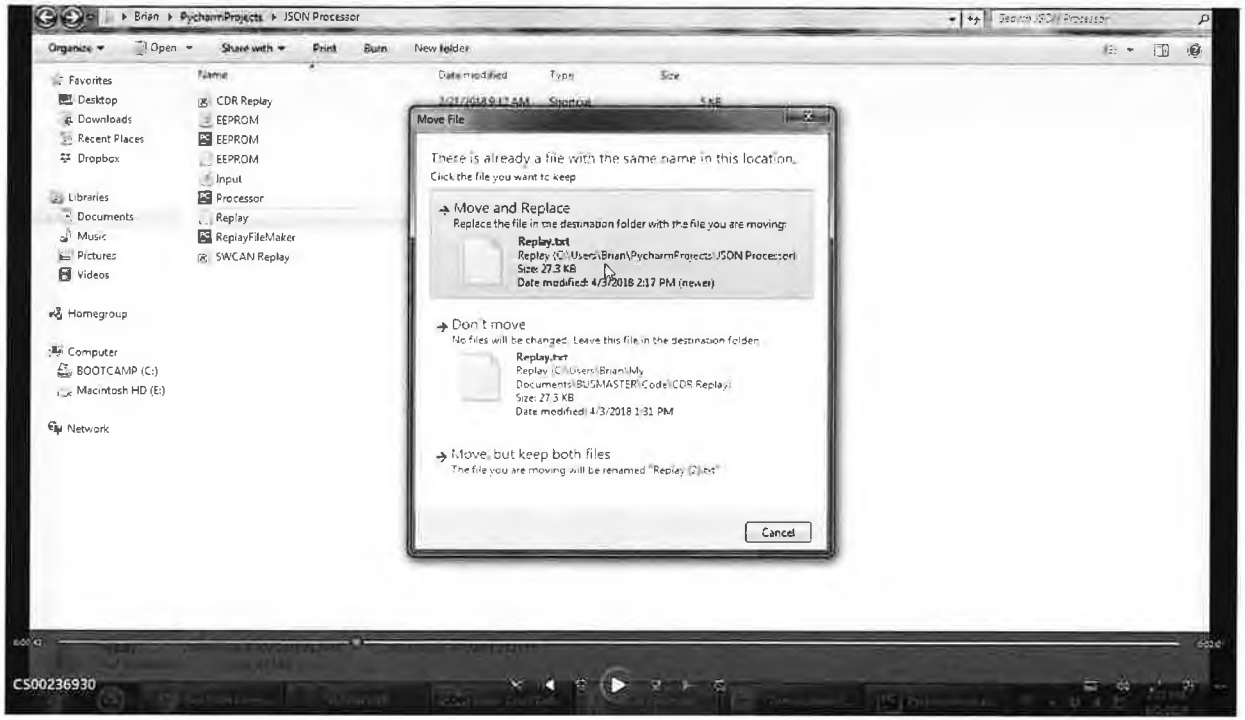
CS00236930.WMV

Replay File Moved



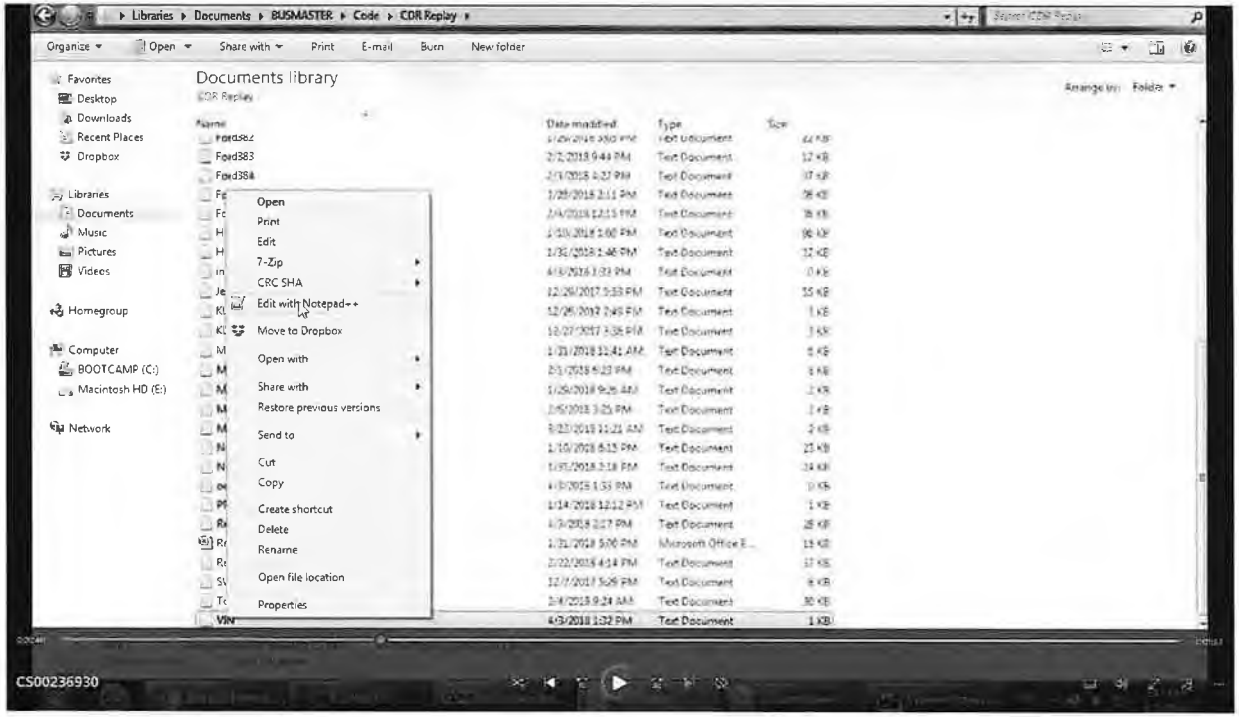
CS00236930.WMV

Move Replay file



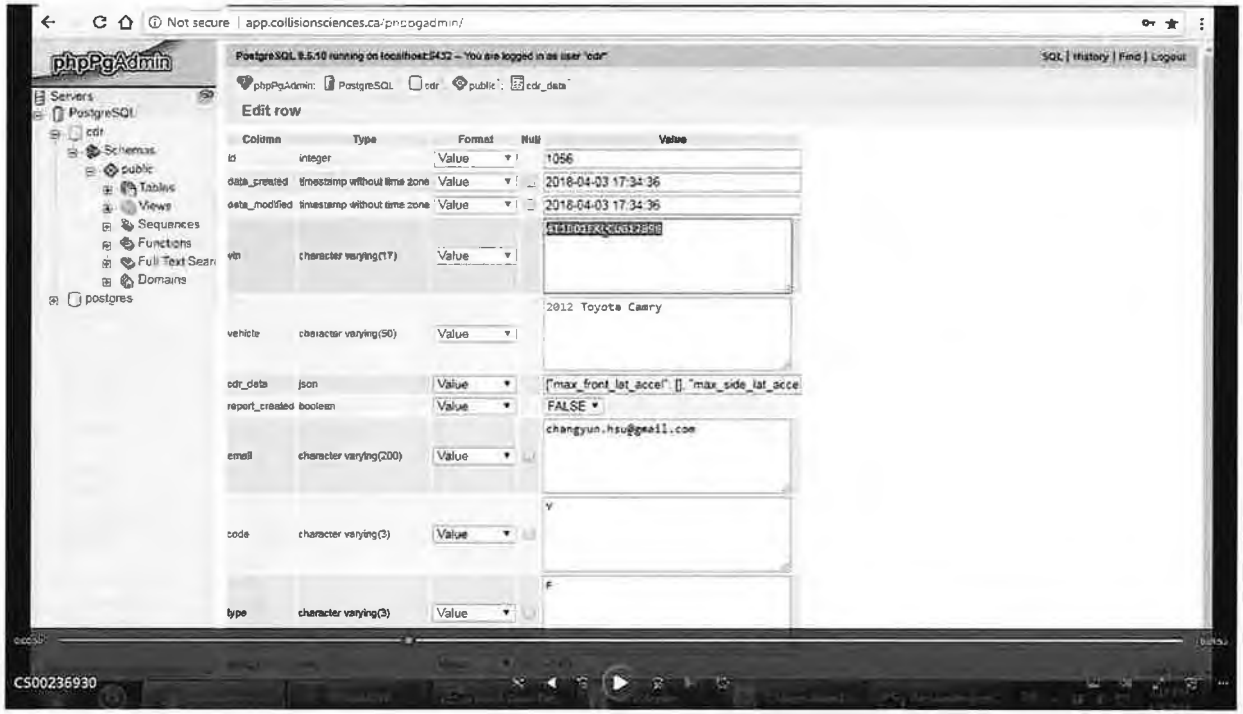
CS00236930.WMV

Edit VIN



CS00236930.WMV

Copy VIN from Database



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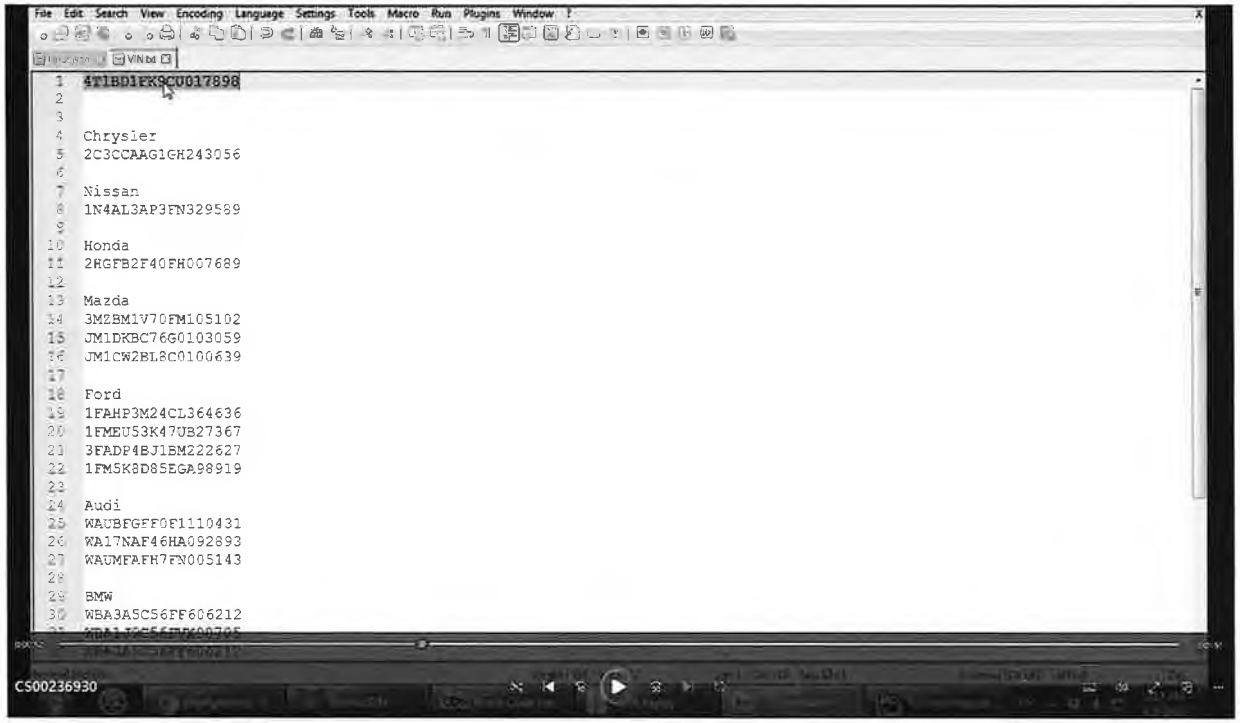
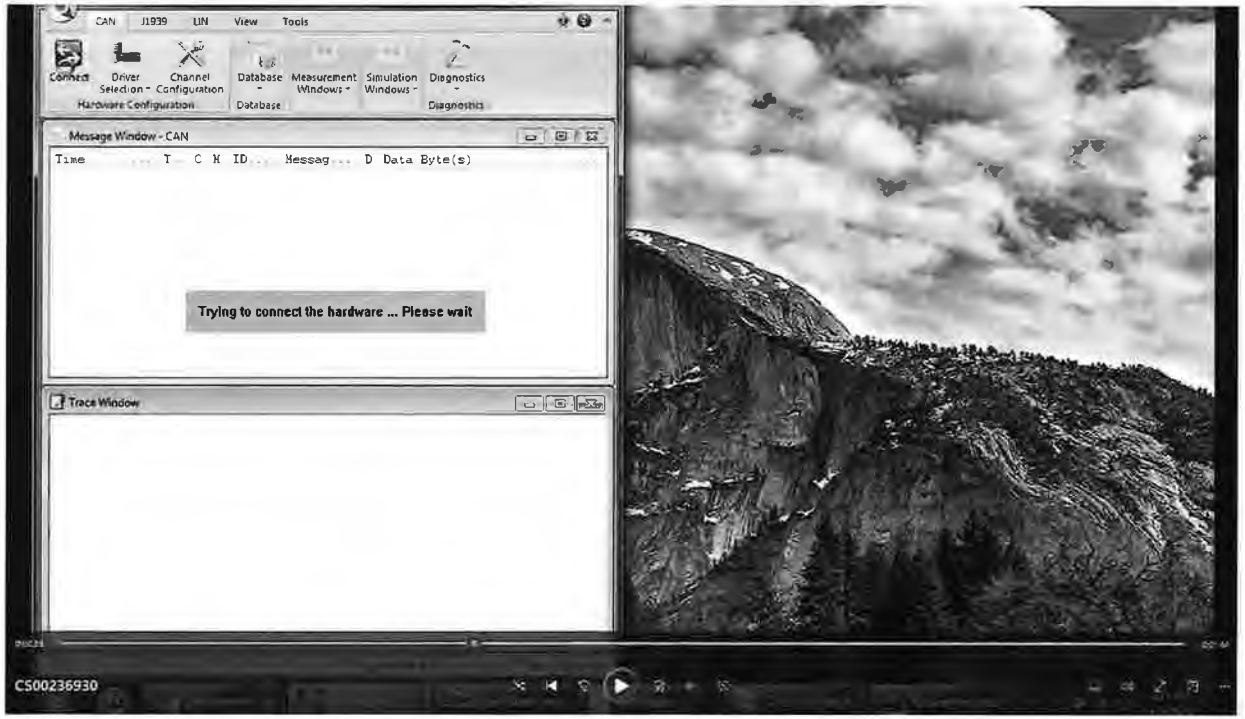
Paste VIN



CS00236930.WMV

Connect Busmaster

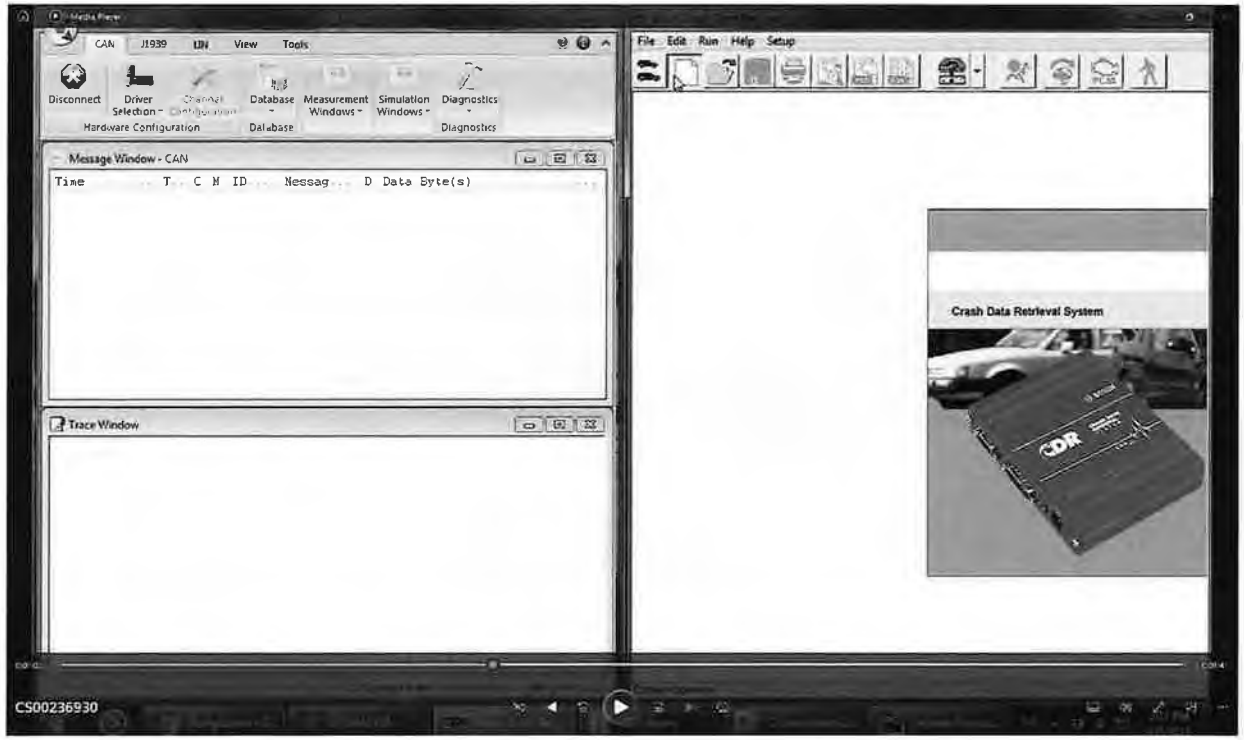


CS00236930.WMV

Bosch CDR Software

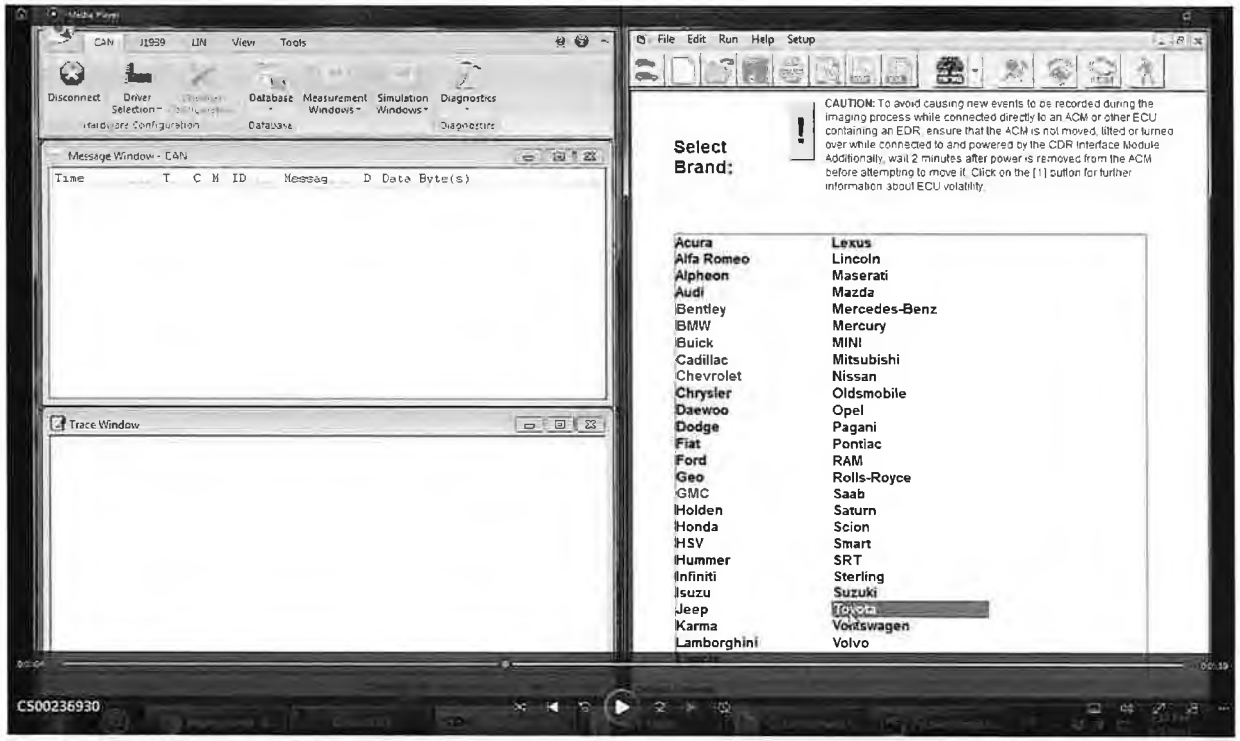
CS00236930.WMV

New File



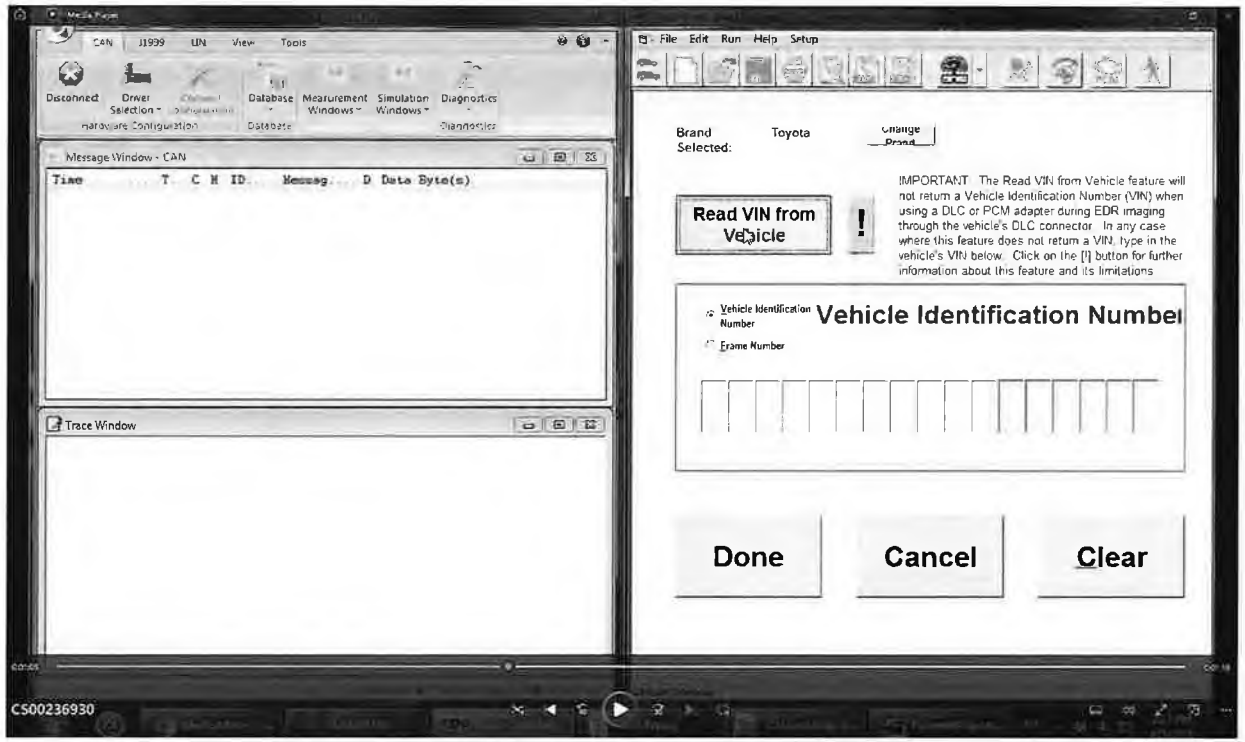
CS00236930.WMV

Select Brand



CS00236930.WMV

Read VIN



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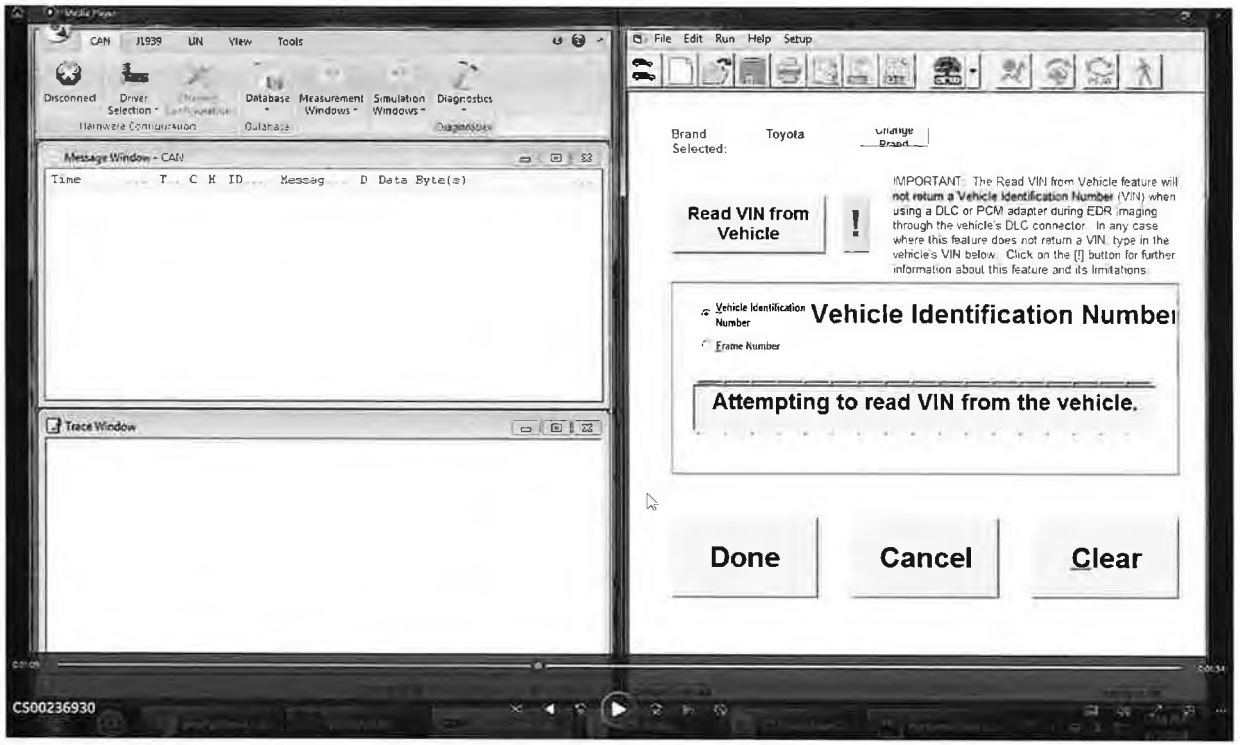
Read VIN



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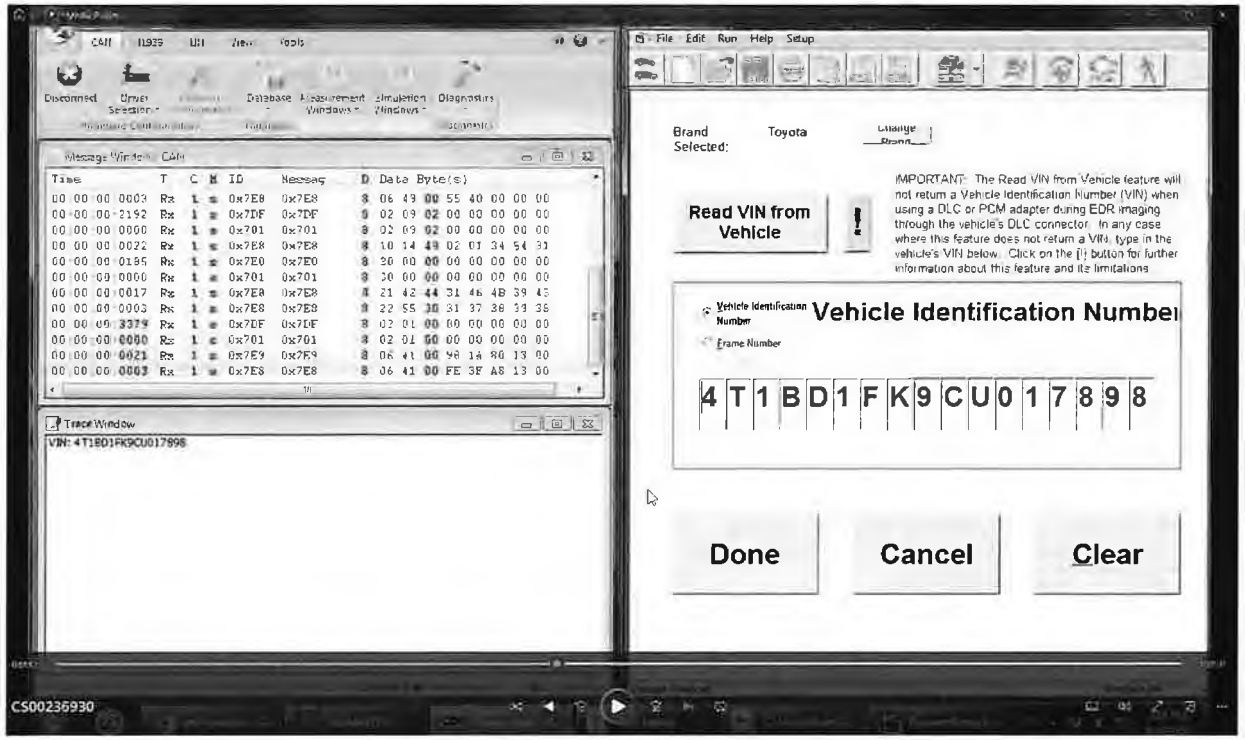
VIN Read



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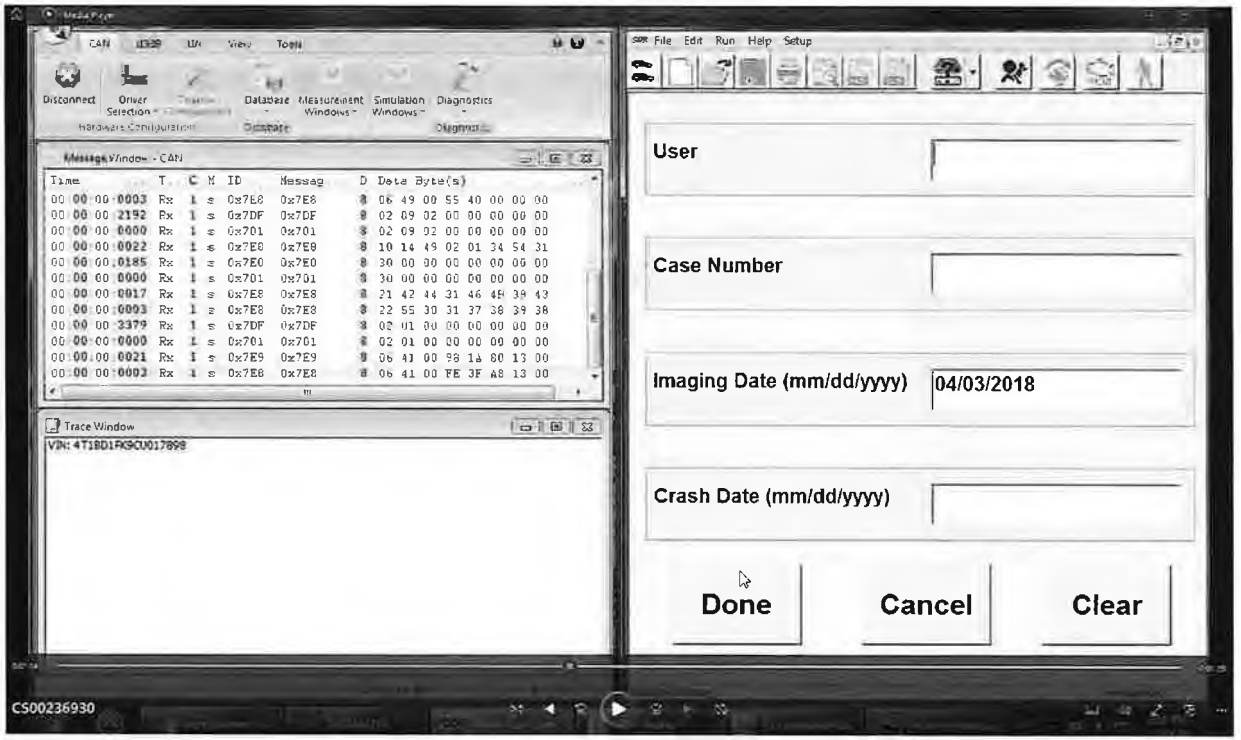
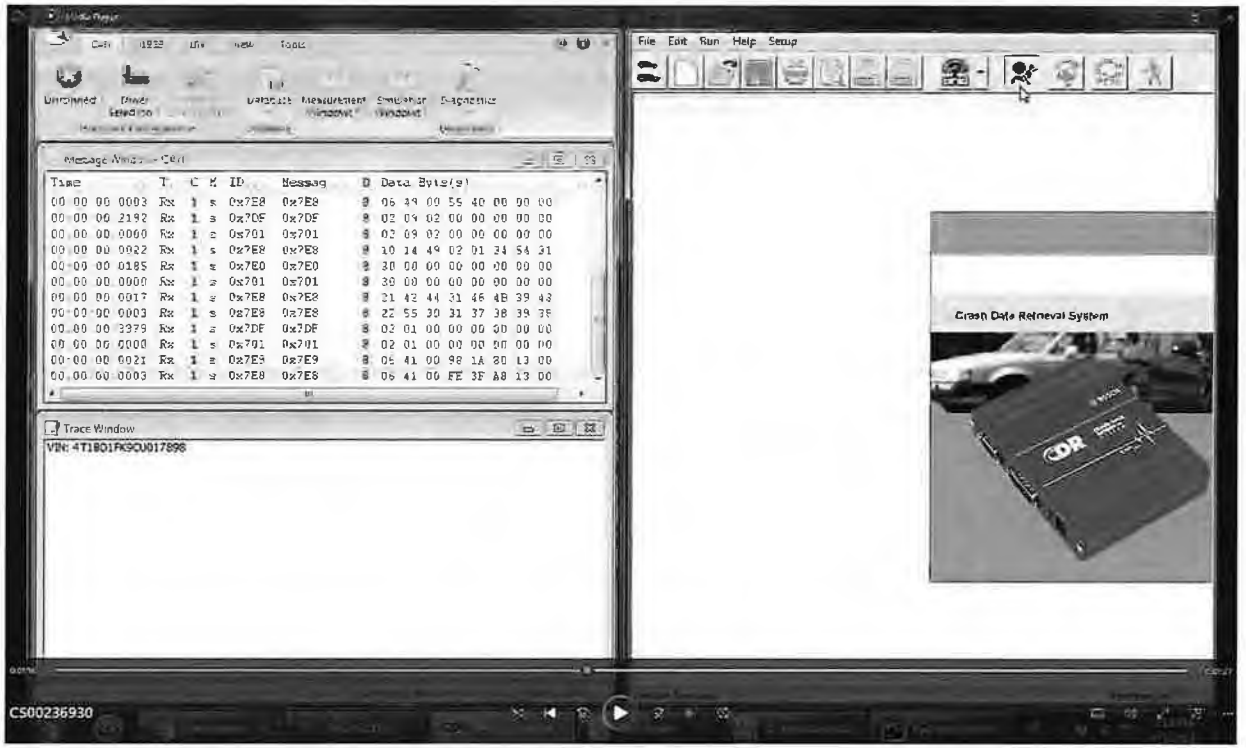
Done



CS00236930.WMV

AirBag



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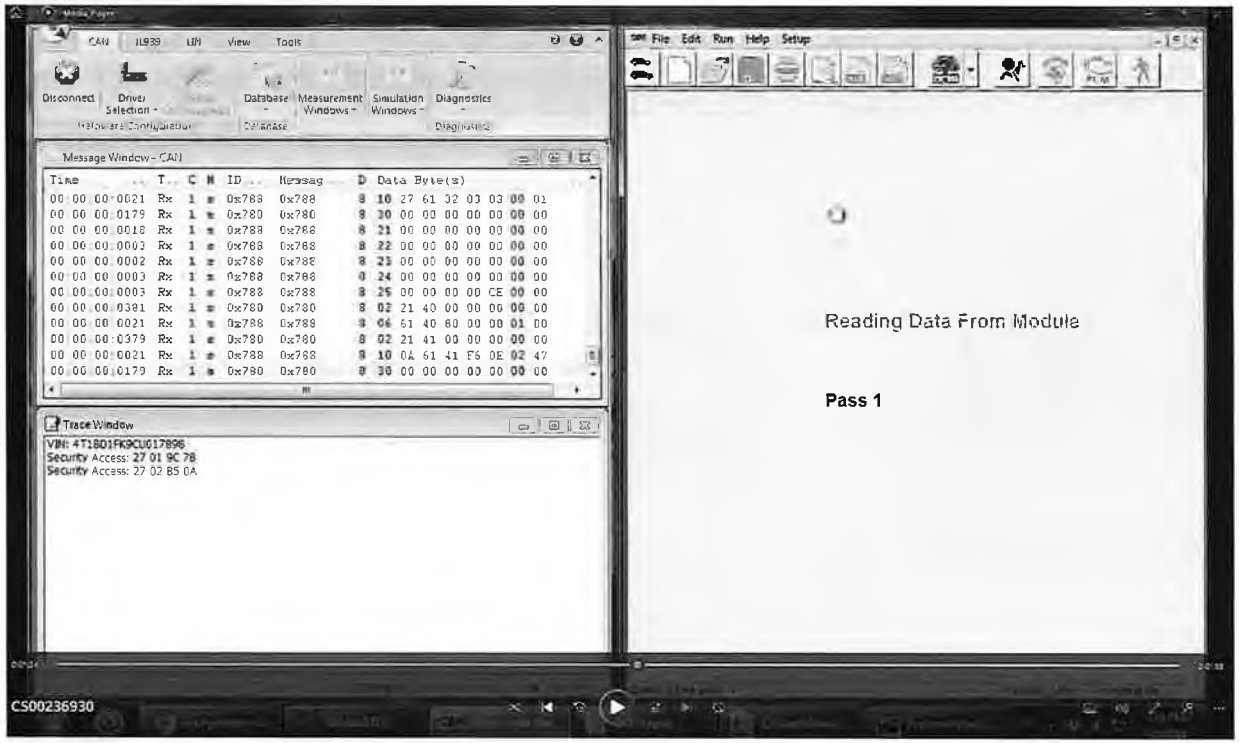
ABM Read



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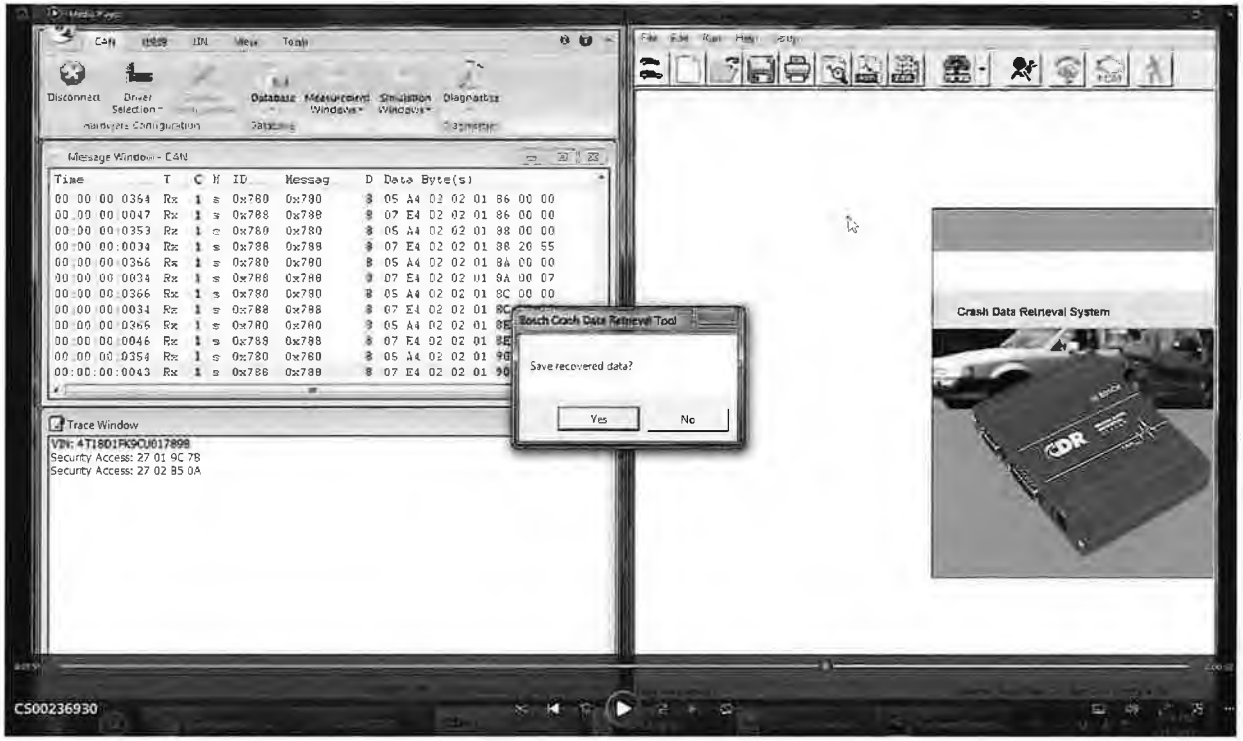

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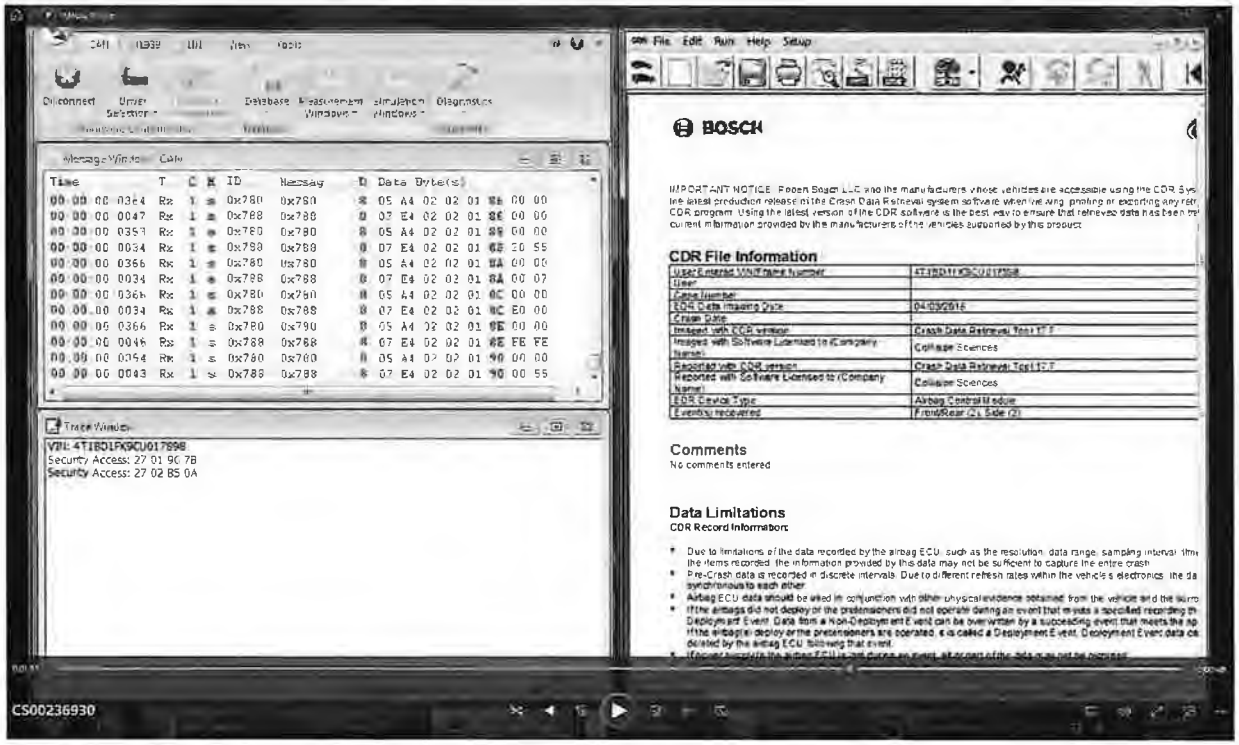
Bosch Report



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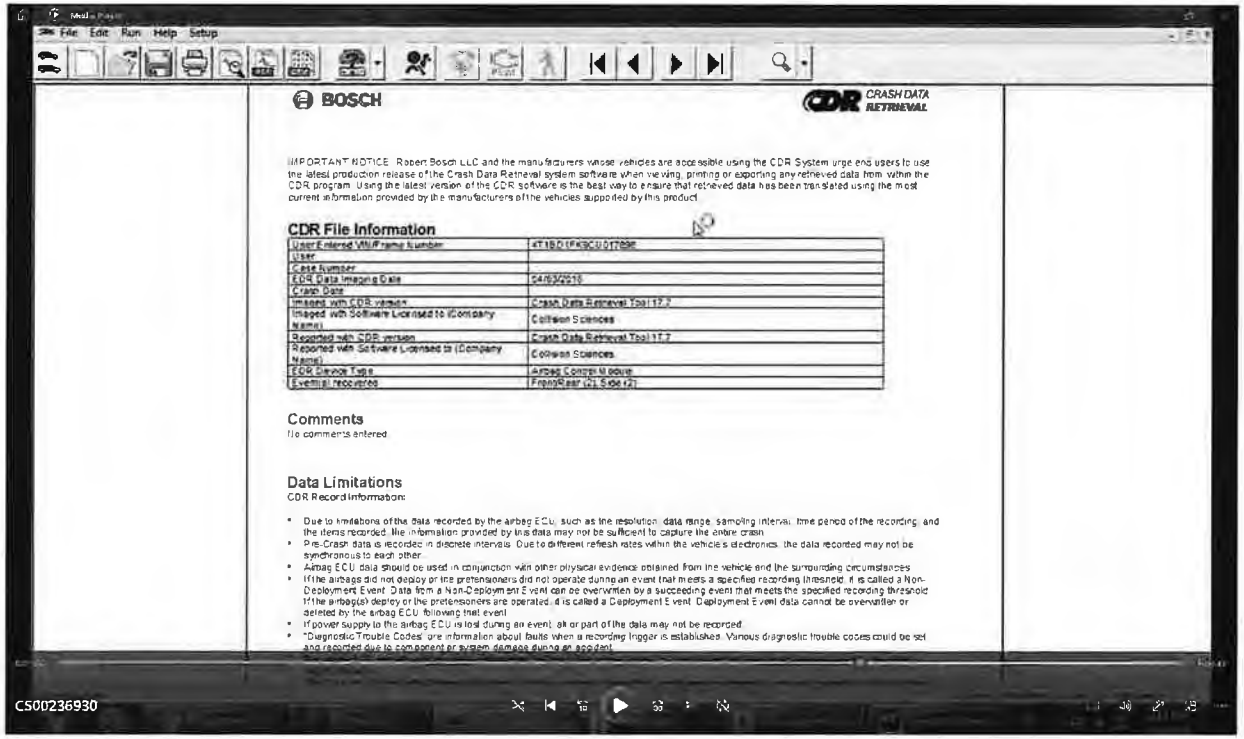

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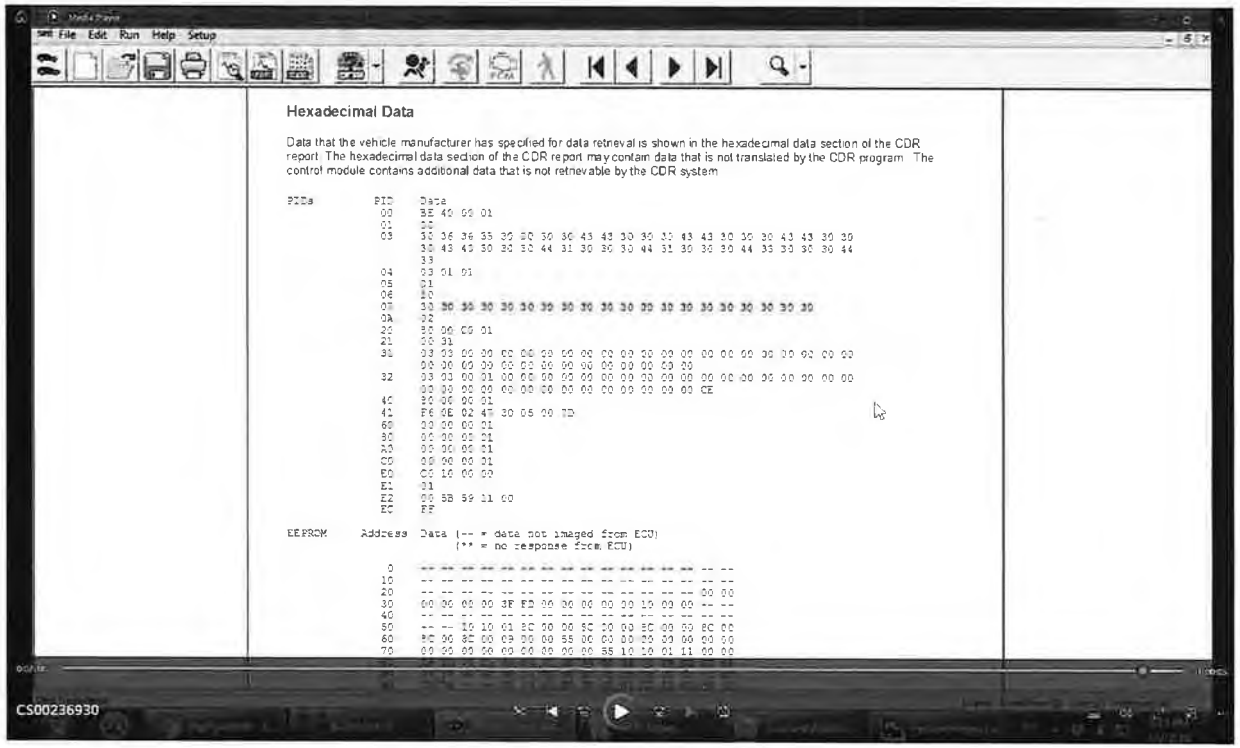
Bosch Report



CS00236930.WMV

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For CDR Tool Software after Activation
Version: May 30, 2019

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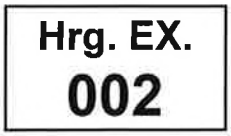

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800-280-7940 ext. 1
crash@crashdatagroup.com
PO Box 892885, Temecula, CA 92589
42206 Remington Ave, Temecula, CA 92590

DATE	SALE #
1/26/2018	SR13248

CHECK #	PAYMENT METHOD	REP
	PayPal	SC

BILL TO	SHIP TO
Collision Sciences 192-1055 Shawnmarr Road Mississuaga, ON L5H 0B7	Electronic Delivery Jason Bayley jasonmbayley@gmail.com

ITEM	DESCRIPTION	QTY	RATE	AMOUNT
F00E900038	CDR Software Subscription: One year - Electronic Delivery USER ID G2058 JAN (01-26-2018 to 01-26-2019)	1	1,050.00	1,050.00

Thank you for your business.

TOTAL (USD$) $1,050.00

Crash Data Group is the sole source distributor for the Bosch CDR Tool in the U.S. and Canada.
View our W9 and Sole Source letter at www.crashdatagroup.com/support
FEIN 463027670

PAID

Hrg. EX.
004

BOSCH CDR TOOL

PRODUCT OVERVIEW

BILL ROSE (AA-AS/PRM3_A-SBA)

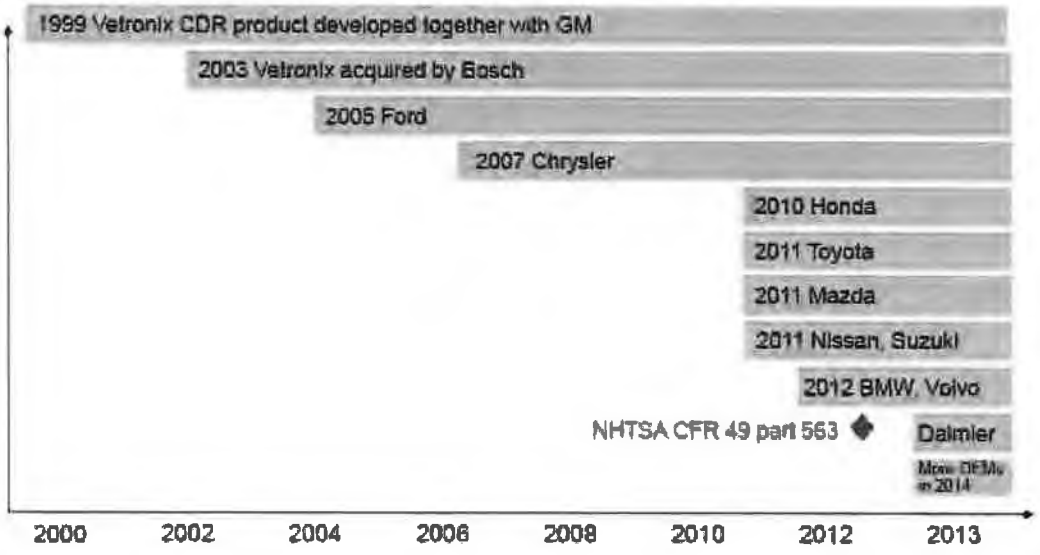
OCTOBER 2019

BOSCH

Hrg. EX.
006

Bosch CDR Tool
CDR Tool - Brief History

- Bosch CDR Tool in market since 1999
- First OEM, General Motors vehicle support (model year 1994+)
- Second, Ford
- Third+, Chrysler, Toyota, Mazda, etc.
- Now 17+ OEMs supported



BOSCH

Bosch CDR Tool
What is the CDR Tool?

- CDR is an acronym for Crash Data Retrieval
- It is a Tool and not installed in a vehicle
- Is used for retrieval of ***crash data*** stored onboard a vehicle (not a diagnostic scan-tool)
- CDR consists of
  - PC Software
  - Vehicle Interface Module
  - Cables and Adapters

BOSCH

Bosch CDR Tool
What it Does

- Retrieves crash data from a vehicle
  - ***Crash data*** is officially referred to as EDR (Event Data Recorder) information or ***EDR Data***
  - Commonly (but incorrectly) referred in the media as "Black Box" data

- The CDR Tool can retrieve EDR Data from one or more ECUs installed in vehicles
  - Airbag control module (typical EDR data storage)
  - Powertrain control module (select older Ford vehicles)
  - Roll-over sensors (select older GM trucks, vans and SUVs)
  - Pedestrian Protection module (select European and US market vehicles)

EVENT DATA RECORDER

An ***EDR*** is a function inside an ECU which records vehicle system sensor, operational & control data before and after a triggered event (in this case, an airbag deployment or near deployment event)

BOSCH

Bosch CDR Tool
Data Retrieved

- Crash Data or Event Data Recorder – triggered base on Passive Safety (airbag) device deployment or near deployment

- Active Safety – data stored based on an Active Safety event (forward collision warning, emergency braking, etc.)

- ADAS (coming soon) – forward/rearward facing camera images, data logger, etc.

Bosch CDR Tool
EDR Data (airbag modules)

-5 to 0 second, pre-crash data

- Vehicle Speed
- Engine Throttle
- Acceleration Pedal
- Brake Pedal
- Ignition Cycle Count (at download & crash)
- Driver Safety Belt
- Frontal Airb Lamp
- Fron eployment Time
- Nu of Events
- Multi-Event Data (count/time between)
- EDR Data Recording Status
- Longitudinal (front/rear) Delta-V Data
- Acceleration Sensor Clipping Status
- Steering Input
- Engine/Motor RPM
- ABS Activity
- Stability Control Status
- Front/Rear/Side Acceleration
- Vehicle roll angle
- Normal (up/down)
- Lateral (sid ata
- Pas y belt status
- er Airbag Suppression
- itch Status
- Frontal Airbag Deployment Times (2nd, nth, disposal stages)
- Side Airbag/Curtain/Tube Deployment Times
- Pretensioner Deployment Times
- Seat Track Position Switch
- Occupant Classification and Position
- Gear Position
- Tire Pressure Indicator Lamp
- Wheel Speed
- Tire Pressure
- 2nd, 3rd Row Seat Belt Status
- Master Cylinder Pressure
- Stability Control S us
- Cruise Co
- Acti ontrol
- odes
- Odometer at Event
- Yaw Rate
- Crash Mitigation Braking & Collision Warning System
- Road/Lane Departure Warning System Status
- Brake Intervention by Stability Control Program

Legislated

Legislated (only if recorded)

OEM Specific

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Bosch CDR Tool
Active Safety (currently GM only)

- Data recorded by Active Safety Systems (e.g., forward collision mitigation, lane keep)
- Example recorded pre-crash data

  - Vehicle Odometer
  - GPS Latitudinal/Longitudinal Position
  - Vehicle Speed
  - Yaw Rate
  - Commanded Transmission Gear
  - Brake Pedal Position
  - Brake Pedal Initial Travel Achieved
  - Driver Initiated Braking
  - Driver Selected Cruise Type
  - Adaptive Cruise Control Cruise (Mode, Status, etc.)
  - Adaptive Cruise Control Activity
  - Lane Centering Control States and Statuses
  - Lane Centering Control Driver Override
  - Pre-Automatic Braking Accelerator Override
  - Post-Autonomous Braking Accelerator Pedal Override
  - Driver Override Status - Driver Braking
  - Driver Attention State
  - Driver Hands on Steering Wheel
  - Vehicle Ahead Indication
  - Alert Warning Indication

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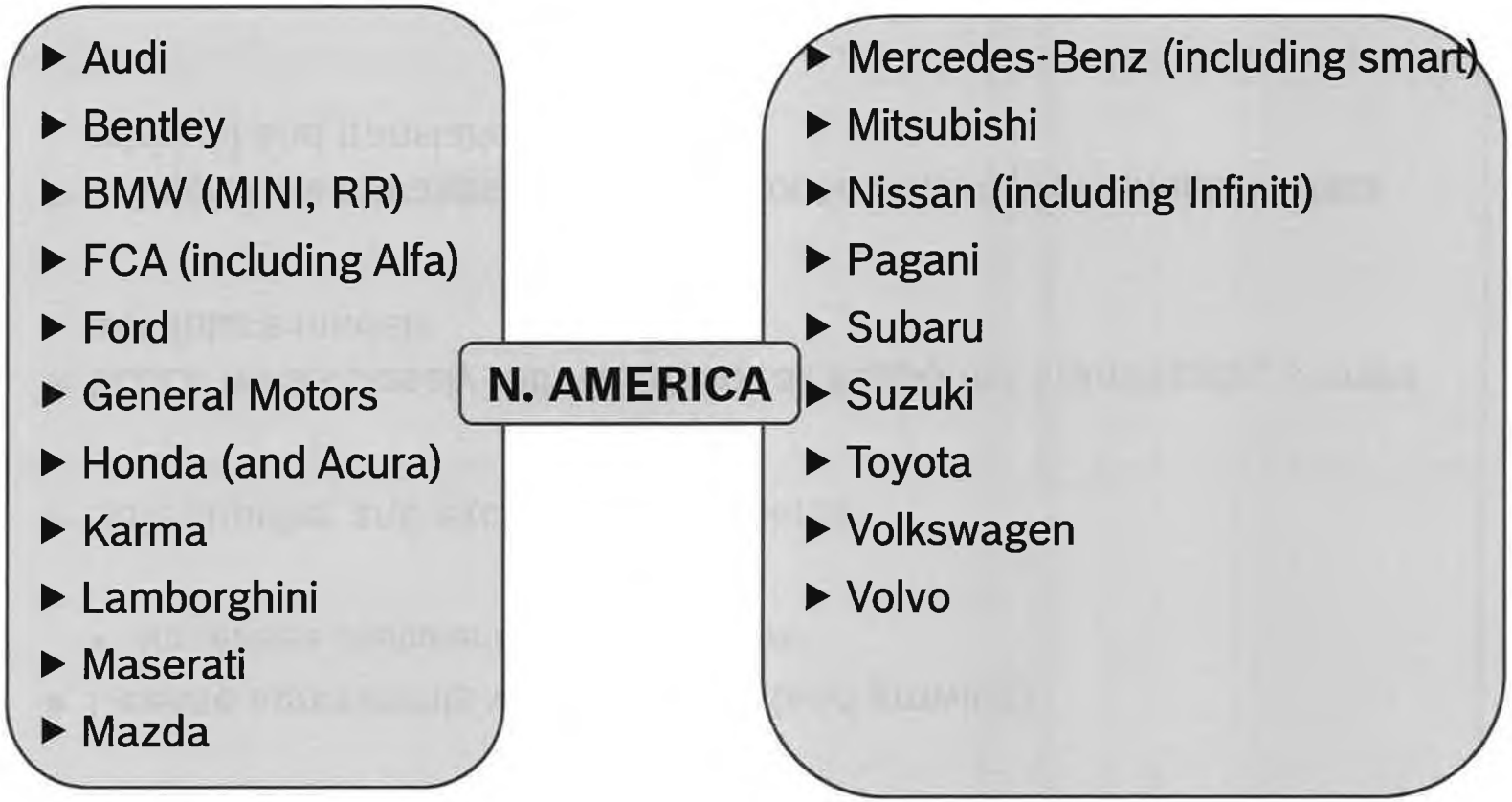
Bosch CDR Tool
OEM Approved & Validated

- License agreements with 20 OEMs (and growing)
  - No reverse engineering or "guess work"
- Sole supplier and exclusive agreements
- Bosch works closely with OEMs for all supported brands past, current and future models
- 4-6 software releases per year for continuous improvements in data retrieval and translations

Bosch CDR Tool

Supported OEM Brands



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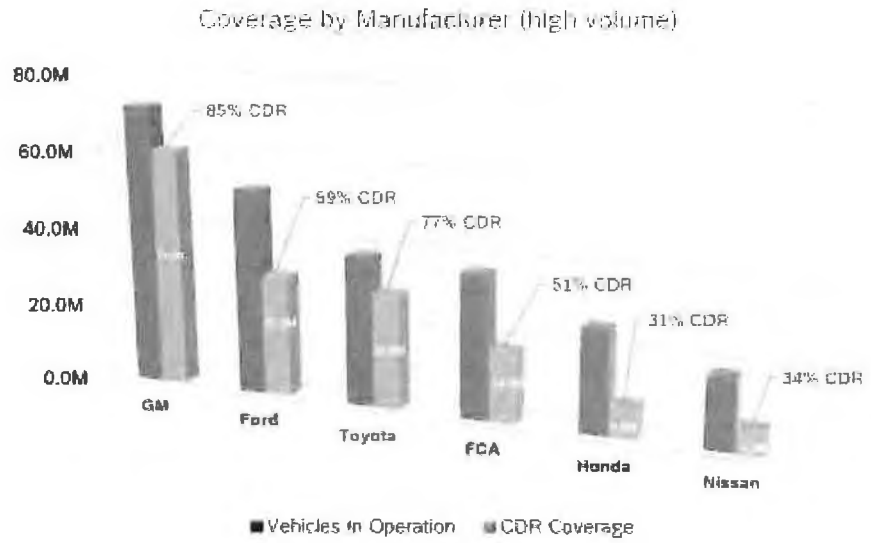
Bosch CDR Tool
OEM Vehicle Coverage, Car Park (US/CA)?

- Light duty Vehicles In Operation (US and Canada)
  - Total population 297M
  - CDR coverage 162M
  - CDR coverage 55%



BOSCH

Bosch CDR Tool
How it Works

- Data can be retrieved using 2 possible means of physical connection

OBD (DLC) Connector

Direct to Module

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Bosch CDR Tool

Common Report Output (worldwide)

- CDR Tool delivers data via common report formats for all supported OEMs
- Users can export the data to CSV and PDF output

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Bosch CDR Tool
Market Price

- Base CDR Kit (for OBD downloads only)
  - $5,800 MSRP (CDR Kit (new & legacy coverage) – US/CA)

- Annual Software Subscription
  - $1050 MSRP (US)

- Cables for direct-to-module retrieval are
  - $165 - $220 ea MSRP
  - 90+ direct to module cables

Bosch CDR Tool
Use Cases

- Reconstruction of vehicle accidents
- Validate insurance claims & fraud detection
- Vehicle safety research (universities, Government, etc.)
- OEM
  - Obtain "real-world" data from crashes to improve safety and performance-related functions
  - Defend their products in litigation

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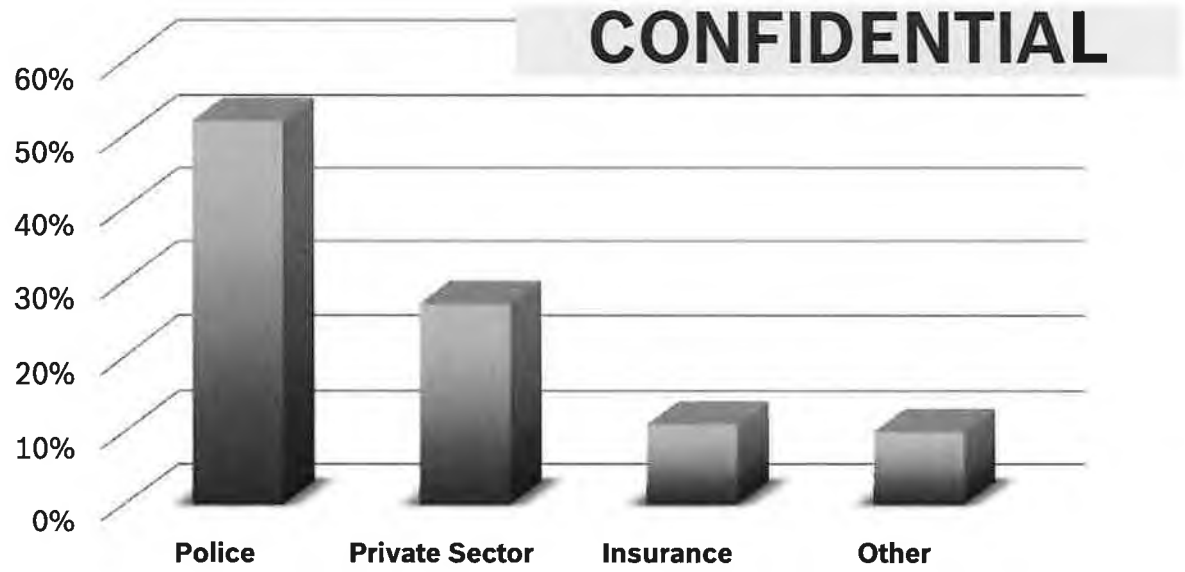
Bosch CDR Tool Customers

- Law Enforcement Agencies
- Independent Accident Investigators
- Insurance Companies
- Fleet owners
- OEMs
- Government Agencies
  - NHTSA (National Highway Traffic Safety Administration)
  - NTSB (National Transportation Safety Board)

Bosch CDR Tool Customers



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Bosch CDR Tool
Market Drivers

- US Regulation CFR 49 Part 563 (voluntary) September 2012
- New regulations in various other countries (China, Korea, Europe, Japan, etc.)
- Active Safety System and ADS technology
- Insurance fraud detection (hit-while-parked, who-hit-whom-first)

Bosch CDR Tool Insurance

CONFIDENTIAL

- CDR and the Top 10 Insurance Companies (~300 CDR users, and growing)

Company	Market Share 2017	Direct Premiums Written in 2017	Bosch CDR Tool
State Farm	18.13%	$41.8 billion	YES
Geico	12.83%	$29.6 billion	YES
Progressive	9.88%	$22.8 billion	NO
Allstate	9.29%	$21.4 billion	NO
USAA	5.7%	$13.2 billion	YES
Liberty Mutual	5.02%	$11.6 billion	YES
Farmers	4.49%	$10.4 billion	YES
Nationwide	3.18%	$7.3 billion	NO
Travelers	1.91%	$4.4 billion	YES
American Family	1.9%	$4.4 billion	YES
All other insurance companies (25)	N/A	N/A	YES

Source: National Association of Insurance Commissioners (for market share and direct premiums)

#1 CDR

70% of Top 10

BOSCH

Bosch CDR Tool
Insurance, Use-Cases

- Fraud detection and Claims Validation
  - Help to determine cause/fault for legal actions or claim processing
  - Do injury claims match recorded crash severity?
  - Who was driving and how fast?
  - Who were wearing seatbelts?
  - Who hit whom first?
  - Hit-While-Parked claims

Bosch CDR Tool
North America CDR Tool Distributor

CRASH DATA GROUP

Temecula, California

www.crashdatagroup.com

sbaker@crashdatagroup.com

Office: (951) 252-9254

Toll Free: (800) 280-7940

BOSCH

Bosch CDR Tool
CDR Tool Training – 3rd Party

US/Canada

Collision Safety Institute (CSI)
Rusty Haight
(858) 484-8784
www.collisionsafety.net

Crash Data Specialists
Brad Muir or Jon Northrup
(585) 480-4515
www.cdr-trainers.com

Institute of Police Technology and Management
Rick Ruth
(313) 910-5806
www.iptm.org

Northwestern University Center for Public Safety (NUCPS)
Roy Lucke
Tel (800) 323-4011
Tel (847) 491-3460
www.northwestern.edu/nucps

Europe & Middle East

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awg mbH
CDR Training Section
Dr.-Ing. Oliver Brockmann
Tel. +49 (2851) 9848-0
www.cdrtraining.eu

BOSCH

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	4S4WMAJD7K3435147
User	NONE
Case Number	NONE
EDR Data Imaging Date	
Crash Date	
Filename Saved on	4S4WMAJD7K3435147_ACM 2019 SUBARU ASCENT.CDRX Thursday, July 2 2020 at 12:23:00
Imaged with CDR version	Crash Data Retrieval Tool 19.4
Imaged with Software Licensed to (Company Name)	Collision Sciences
Reported with CDR version	Crash Data Retrieval Tool 19.4
Reported with Software Licensed to (Company Name)	Collision Sciences
EDR Device Type	Airbag Control Module
Event(s) recovered	Record 1

Comments

No comments entered.

Data Limitations

CDR Record Information:

1. Due to limitations of the data recorded by the airbag ECU, such as the resolution, data range, sampling interval, time period of the recording, and the items recorded, the information provided by this data may not be sufficient to capture the entire crash.

2. Pre-Crash data is recorded in discrete intervals.
Due to different refresh rates within the vehicle's electronics, the data recorded may not be synchronous to each other.

3.Airbag ECU data should be used in conjunction with other physical evidence obtained from the vehicle and the surrounding circumstances.

4. If the airbags did not deploy or the pretensioners did not operate during an event that meets a specified recording threshold, it is called a Non-Deployment Event. Data from a Non-Deployment Event can be overwritten by a succeeding event that meets the specified recording threshold. If the airbag(s) deploy or the pretensioners are operated, it is called a Deployment Event.
Deployment Event data cannot be overwritten or deleted by the airbag ECU following that event.

5. If power supply to the airbag ECU is lost during an event, all or part of the data may not be recorded.

6. The Subaru Select Monitor 3 or Subaru Select Monitor 4 can be used to obtain detailed information on the diagnostic trouble codes from the airbag system , as well as diagnostic information from other systems.

General Information:

1. The airbag ECU records data for all or some of the following accident types: frontal crash, rear crash , side crash, and rollover events. Depending on the installed airbag ECU, data for side crash and/or rollover events may not be recorded.

2. This airbag ECU records data before crash and data after crash - When a single event occurs independently, the data of this event is recorded one to one.
- When multiple events occur consecutively, information on two crash events can be recorded in one storage space.

3. The airbag ECU has two spaces for recording crash data.Regarding vehicles equipped with pedestrian protection devices, there is one dedicated area for recording data of crash with pedestrians, in addition to the above two recording areas.

4. The data recorded by the airbag ECU includes correlating information between each previously occurring event (i.e., information that clarifies the collision event sequence.

5. This airbag ECU defines the point of algorithm wakeup as T0.

6. The recording trigger judgment threshold value differs depending on the collision type (i.e., frontal crash, rear crash, side crash, or rollover event).

7. Some of the data recorded by the airbag ECU is transmitted to the airbag ECU from various vehicle control modules by the vehicle's Controller Area Network (CAN).

Hrg. EX.
030

Date:	Thursday, July 2 2020 08:53 PM
Subject:	Fwd: CrashScan - 3 Test Subaru Scans
From:	Mike Merolli <mikemerolli@gmail.com>
To:	Rose Bill (AA-AS/PAO11) <Bill.Rose@us.bosch.com>;
Attachments:	MAPFRE Insurance.zip; JF1GPAS64EH334872_ACM 2014 Subaru Impreza.PDF; [Case MAPFRE-00004] 20200630 CL 2014 Subaru Impreza.pdf; 4S4WMAJD7K3435147_ACM 2019 Subaru Ascent.PDF; [Case MAPFRE-00006] 20200630 CL 2019 Subaru Ascent.pdf; 4S4BSAFC9K3364845_ACM 2019 Subaru Outback.PDF; [Case MAPFRE-00002] 20200630 CL 2019 Subaru Outback.pdf

--------- Forwarded message ---------
From: **Jason from Collision Sciences** <jbayley@collisionsciences.ca>
Date: Thu, Jul 2, 2020 at 1:15 PM
Subject: CrashScan - 3 Test Subaru Scans
To: mikemerolli <mikemerolli@gmail.com>

Hi Mike,

Please find attached the requested reports from your Subaru scans. I'm glad you were able to easily retrieve the crash data using CrashScan. Note that we can customize our reports, and even include the raw (acceleration) data if you like, but typically, we only provide that data upon request.

For your personal vehicle, note that our EDR Claims Report is structured assuming a collision occurred (suggesting an LVI and corresponding injury risk information).

We are also updating our enhanced diagnostics and injury risk data science and information.

Let me know if you have any questions.

Kind regards,

Jason Bayley, P.Eng.
Collision Sciences | CEO & Founder
M: +1 905 599 9899
www.collision-sciences.com | CrashScan™ on Android and iOS | EDR Vehicle Support

Hrg. EX. 031

Collision Sciences ***CLAIMS REPORT***

EXPOSURE, RISK & DECISION SUPPORT

Vehicle: 2014 Subaru Impreza

VIN: JF1GPAS64EH******

Report Number: MAPFRE-00004

Generated: 2020-07-02 16:31:20

REPORT SUMMARY

This section provides an overview of the predictive analytics used for the estimation of claim severity, exposure, and fraud risk for the most recent crash or event sequence.

A moderate rear-end crash was detected by the Event Data Recorder with a recency of 17 ignition cycles ago. If the detected event is related to the claim in question, the mean acceleration in the impact was 4.14 g.

Occupant Injury Risk

1st Party (Scanned Vehicle) - Statistical Likelihood of Minor Injury Symptoms: 59% (Likely). Statistical Likelihood of Moderate Injury: 22% (Possible)

3rd Party (Other Vehicle): Statistical likelihood of occupant injury is dependent on other vehicle weight, impact configuration, and other factors. Refer to the table within the report to assess potential risk.

Pre-Crash Data

The following reconstruction data analysis relates to the moderate rear-end crash that was detected by the Event Data Recorder (having a recency of 17 ignition cycles ago):

Within the 5.0 seconds of recorded pre-impact data for the most recent crash, the recorded speed range on this vehicle was **2 mph** to **40 mph**. The vehicle speed was **2 mph** at the moment of impact.

Driver/Vehicle Maneuver:
Driving and got rear-ended. Going straight

Flags / Loss Indicators

Low-Medium Risk (1 Alert): Emissions Test Failure

Diagnostic Scan Results

Event Data Recorder
Scan completed successfully. Crash data detected.

Emissions Testing
Scan completed successfully. Emissions test failed. 4 DTCs found.

Enhanced Diagnostics
N/A

Safety / VIN History	**Safety Issues** 3 potential recalls found. Possible Structural/Frame Damage. Even minor damage, if not repaired properly, can seriously degrade a car's ability to protect you in an accident. **VIN History** 2 title records found. Latest known mileage: 27 miles.
Recommended Action	Confirm the relevance of the crash event data to the reported collision claim by verifying that the event data recency (based on ignition cycles or mileage) is consistent with the Date of Loss (based on approximate vehicle usage). Check that the pre-crash data is consistent with the reported circumstances.

CRASH DATA RECORDS

This section lists crash data records stored on the vehicle's event data recorder, if any. The date of data collection was 2020-06-30.

Recency (Sequence)	Crash Severity	Type / Damage Area	Sudden Speed Change (Delta-V)	Force of Impact (Mean g-Force)	Principle Direction of Force (PDOF)	Ignition Cycles since Event
Most Recent	Moderate	Rear	11.81 mph (Increasing)	4.14 g	183 degrees (6 o'Clock)	17

How To Interpret This Information

A moderate rear-end crash was detected by the Event Data Recorder. At the time of data retrieval, the vehicle's ignition had been turned on 17 times since the crash event recording.

The mean (average) acceleration in the most recent crash event was 4.14 g (up to the maximum Delta-V). The maximum Delta-V (Change in Velocity) value as measured by the airbag module's accelerometer reached 11.81 mph within 130 milliseconds, with an instantaneous peak force level of 8.49 g. The vehicle experienced a sudden increase in speed due to the most recent collision, by a force acting on the vehicle from a direction of approximately 6 o'clock (where the front of the vehicle is 12 o'clock).

Crash events are sorted and displayed in order of recency. It is possible for an airbag module to contain multiple records for a single event. In that case, event recency will be further marked by "1st Impact", "2nd Impact"...etc., with "1st Impact" being the initial record in sequence.

Event Data Applicability

Confirm the relevance of the crash event data to the reported collision claim by verifying that the recency (based on ignition cycles or mileage) is consistent with the Date of Loss (based on approximate vehicle usage). Check also that the pre-crash data is consistent with the vehicle's reported pre-impact speed and maneuver.

Example calculation of daily vehicle usage: If the vehicle was reported to be used an average of 2 times per day between the collision and date of data retrieval (2020-06-30), the recorded collision event could be estimated to have occurred approximately 8 days prior, on or about 2020-06-22. The number of ignition cycles indicates the number of times the ignition has been turned on (to key on, engine off position). Vehicles with automatic start-stop systems (engine idle off) do not increase the ignition cycle count. A similar calculation can be performed using daily mileage.

A lack of relevant crash event data for the collision under investigation indicates any of the following:

1. The vehicle was powered off at the time of the impact
2. The impact severity failed to meet the minimum required threshold for the EDR to record

EDR Trigger Thresholds

EDRs calculate the Delta-V (the sudden change in velocity), by integrating accelerometer data after being

triggered at a predefined threshold, which can vary by manufacturer.

For Subaru, a front/rear (longitudinal) or side (lateral) acceleration recording is expected to be triggered when the cumulative delta-v is over 5.0 mph, where the time series data will be recorded for up to 250 ms (sampled at 100 times per second).

Note that while 5.0 mph (1.51 g) is a regulated EDR trigger threshold, some vehicle makes/models are able to record crash events below this threshold, in certain situations. The following trigger thresholds are known for Subaru vehicles:

Longitudinal (Front/Rear): 5.0 mph within 150 ms, or 1.51 g.
Lateral (Side): 5.0 mph within 150 ms, or 1.51 g.

If a recent Low Velocity Impact occurred, the overall transfer of forces to the occupant are expected to have been below the known EDR trigger thresholds. In this situation, consider further investigation, such as an IME (Independent Medical Examination).

An EDR (Event Data Recorder) is a function or device installed in a motor vehicle to record technical information about the status and operation of vehicle systems for a few seconds immediately before and during a crash for the primary purpose of post-crash assessment [1]. EDRs are regulated under 49 CFR part 563. Part 563 was established on August 28, 2006 (71 FR 50998) and requires that light vehicles [2] equipped with EDRs meet certain requirements for data elements, data capture and format, data retrieval, and data crash survivability. An EDR as defined by Part 563 is not required to record data such as audio or video recordings and does not log commercial operator-associated data, such as hours of service [3]. The requirements of Part 563 apply only to those light vehicles that are voluntarily equipped with EDRs that were manufactured on or after September 1, 2012.

PRE-CRASH DATA / Most Recent

This section lists pre-crash data records stored on the vehicle's event data recorder.

Time Before Impact (sec)	Distance to Impact (feet)	Vehicle Speed (mph)	Engine Speed (RPM)	Accelerator Pedal (%)	Brake Status	Deceleration (g)	Steering Angle (deg)
-5.00	N/A	40	1300	0.0	On	N/A	-2.5 (Straight)
-4.50	98.9	35	1300	0.0	On	-0.4 (Moderate)	0.0 (Straight)
-4.00	74.5	31	1400	0.0	On	-0.4 (Moderate)	0.0 (Straight)
-3.50	53.5	26	1400	0.0	On	-0.5 (Moderate)	5.0 (Straight)
-3.00	36.5	21	1400	0.0	On	-0.5 (Moderate)	10.0 (Straight)
-2.50	23.2	16	1300	0.0	On	-0.5 (Moderate)	10.0 (Straight)
-2.00	13.7	11	1100	0.0	On	-0.5 (Moderate)	7.5 (Straight)
-1.50	7.3	7	1100	0.0	On	-0.3 (Moderate)	7.5 (Straight)
-1.00	3.4	4	800	0.0	On	-0.3 (Light)	7.5 (Straight)
-0.50	1.4	2	700	0.0	On	-0.2 (Light)	15.0 (Left)

0.00	0.0	2	700	0.0	On	0.0 (Light)	15.0 (Left)

How To Interpret This Information

Each pre-crash data set contains recorded vehicle operating status 5.0 seconds prior to impact. Accelerator Pedal, Brake Switch Status, and Steering Angle can be used to reconstruct the driver's maneuver leading up to the impact.

Deceleration (in g) is calculated using speed differences between data points. Note that deceleration depends heavily on road conditions. For example, in winter driving conditions, it may only be possible to reach a peak deceleration of 0.2g.

SEAT BELT & AIRBAG STATUS

This section lists the restraint system status at the time of the event recording, including airbag deployment status and the seatbelt buckle insertion status for supported seating positions.

MOST RECENT	Driver	Front Passenger
Occupant Classification	Occupied	Unoccupied
Safety Belt Status	Buckled	Unbuckled
Frontal Airbag	Not Deployed	Not Deployed
Side Seat Airbag	Not Deployed	Not Deployed
Side Curtain Airbag	Not Deployed	Not Deployed
Knee Airbag	Unavailable	Unavailable

FLAGS / LOSS INDICATORS

This section lists flags for further investigation based on known anti-fraud indicators and/or inconsistencies with reported circumstances.

Indicator	Description	Risk Alert
Drive Down	Frontal collision where the driver accelerates up to impact, with no pre-impact brake application.	No
No Avoidance Maneuver	No driver input for either brake or steering maneuver within the 2 seconds prior to impact.	No
Possible Distracted Driver	In a frontal collision, driver did not either brake or steer 2 seconds prior to impact.	No
No Pre-Impact Speed Reduction	Brake is only applied lightly with no meaningful reduction in speed.	No

Steered-To Sideswipe	Driver steers either left or right, causing an impact on the steered-to side.	No
Swoop & Squat	Driver steers to make a lane change and quickly applies brakes.	No
Panic Stop	Rear-end collision where driver brakes just prior to impact.	No
Possible Non-Recent Event	Accident recording may not be recent. Event data recorded 50 or more engine starts prior to data retrieval. Possible issues include: unrelated damage, past posting (no insurance at time of collision)	No
Possible Intentional Damage	Event data recorded on successive engine starts (sequential ignition cycles), or multiple events recorded on the same ignition cycle, where pre-crash data does not overlap.	N/A
Pre-Damaged Vehicle	Evidence of prior accident damage, where data of multiple events was recorded at different engine starts. Possible issues include: Unrelated Damage to Incident, staged Hit & Run, Phantom Accident, or Paper Accident.	N/A
Unbuckled Driver	Driver not wearing seat belt at the time of crash data recording.	No
Unbuckled Passenger	Front passenger not wearing seat belt at the time of crash data recording.	No
Emissions Test Failure	Vehicle failed emissions inspection due to insufficient sensor data or diagnostic trouble codes (DTCs).	**Yes**
Low Velocity Impact	An impact in which the mean acceleration is below 3.0 g	No
Odometer Rollback	Flags tampering through a discrepancy with mileage (odometer reading) for successive crash events. Example: for EDRs that store mileage at the crash event, if the most recent crash event has a lower mileage, this is evidence of odometer tampering.	N/A

Reported Circumstances

The flags in this section are generated through cross-referencing provided information (if any).

Indicator	Description	Diagnostic and Predictive Data	Reported Info
Reported Number of Occupants	Compares the reported number of occupants to the available seat sensor data.	1	N/A
Reported Maximum Pre-Impact Speed	Compares the reported travel speed with the pre-crash data and flags a variance of 10 km/h.	40	N/A
Reported Impact Speed	Compares the reported impact speed with the pre-crash data and flags a variance of 10 km/h.	2	N/A
Reported Pre-Impact Maneuver Variance	Compares the reported pre-impact motion with pre-crash data and impact angle for consistency.	Driving and got rear-ended. Going straight	N/A
Reported Appraisal Variance	Compares a provided appraisal estimate with the AI estimate and flags an appraisal variance of +15%.	15500	N/A
Reported Airbag Deployment Variance	Determines whether airbags were manually removed to exaggerate damage by comparing recorded airbag deployment status.	Not Deployed	N/A

VIN Mismatch	Compares the VIN diagnostically retrieved from the vehicle to the the VIN sticker or provided VIN. Requires claim reference number.	JF1GPAS64EH ******	N/A
Image Integrity	Utilizes algorithms to identify digitally edited or altered parts in provided photographs.	N/A	N/A
Pre-Accident Vehicle Sale Attempt	VIN identified in online classifieds within the last 6 months.	N/A	N/A

1ST PARTY (SCANNED VEHICLE) INJURY RISK

This section predicts occupant injury risk ranging from minor to moderate/serious injury for frontal/side/rear collisions. The injury risk is the statistical incidence, likelihood, and probability of injury as tracked in real-world crash studies using event data recorders. The model uses a regression model of crash severity versus reported injuries as published in scientific studies.

Most Recent Event(s)

If the claim under investigation is related to the most recent detected event, the probability of injury based on the maximum delta-V would be as follows.

Delta-V: 11.81 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Rear-ended Occupants	59% (Likely)	22% (Possible)	1% (Improbable)

Low Velocity Impact

If the claim under investigation is related to a recent Low Velocity Impact, the probabilty of injury would depend on the crash type.

Assumed delta-V: 4.97 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Occupants in Frontal Impact	17% (Unlikely)	3% (Improbable)	0% (Improbable)
Rear-ended Occupants	34% (Possible)	7% (Unlikely)	0% (Improbable)
Occupants in Side Impact	34% (Possible)	7% (Unlikely)	0% (Improbable)

How To Interpret This Information

On a balance of probabilities, if the likelihood of injury occurrence is below 50%, it is suggested that an injury is more likely not to have occurred. With a high risk of whiplash or other injury, the claim can be expedited. Early treatment is often effective in providing the best probable outcome for patient recovery.

The injury prediction is based on the actual incidence rate or proportion of injury in tracked studies using data from real-world outcomes. The most important factor in predicting the risk of injury or death in a vehicle crash is the crash severity, which is expressed as the velocity change, or Delta-V, experienced by the vehicle during the crash. The Crash Investigation Sampling System (CISS) is the largest database in the world with over 100,000

cases linking injury outcomes with Delta-Vs, which are obtained from field reconstructions. The effects of occupant age, gender, and belt use on injury and fatality risk have been found substantial.

Low Velocity Impact Studies

Delta-V (Change in Velocity) has traditionally been used to correlate crash severity with the risk of occupant injury (Augenstein et al., 2003; Bahouth et al., 2004; Sunnevång et al., 2009; Kononen et al., 2011). Injury tolerance and risk for various injury types based on real-world crashes with recorded crash data have been established (Gabauer and Gabler, 2006; Gabauer and Gabler, 2008; Kullgren and Krafft, 2008; Ydenius, 2010).

Large-scale retrospective studies have also examined the relationship between minor severity crashes and the risk of occupant whiplash complaints, including studies in the U.S. (Tencer et al., 2001), Germany (Eis et al., 2005; Hell et al., 2002) and Sweden (Krafft et al., 2005). In the minor severity studies it was found that occupant's reporting symptoms for greater than one month corresponded to an average delta-V of 12.4 +/-2.9 mph and a mean acceleration of 5.3 +/-0.6 g. Occupants that sustain soft tissue symptoms for less than one month, on average, corresponded to a delta-V of 6.4 +/-1.3 mph and a mean acceleration of 3.9 +/-0.5 g. The mean acceleration was found to be the best predictor for duration of symptoms.

The following studies describe the impact severity when no injury or only short-term consequences occur: Hell and Langwieder (1998) found that most occupants sustained short-term symptoms in impacts where the change of velocity was 10-15 km/h (6.2-9.3 mph). McConnell et al (1995) performed low-speed rear impacts with seven male volunteers, with velocity changes of up to 10.9 km/h (6.77 mph). None of the volunteers reported whiplash symptoms after a few days. Ono and Kaneoka (1997) and Siegmund et al (1997) found similar results from volunteer tests. In another study with volunteers (Eichberger et al 1996), where the sled impact velocities were 8-11 km/h (4.9-6.8 mph) and the mean deceleration 2.5 g, the volunteers suffered whiplash symptoms for approximately 24 hours.

Typical G-forces (Tolerance)

A hard acceleration or deceleration in a vehicle produces a sustained g-force in the range of 0.6 to 0.8 g. In everyday life, humans experience g-forces stronger than 1 g. The steep ascent of an Airbus A-300 would produce 1.8 g. A sneeze results in about 3 g of acceleration and typical cough produces a momentary force of 3.5 g. A luge athlete may experience forces of 5.2 g. Roller coasters are usually designed not to exceed 3 g but are known to reach 6.3 g. A slap on the back may produce a force of 4 g. Humans typically black out at 6 g, where fighter pilots where special "g-suits" to withstand forces up to 9 g. A car crash with forces of 10 g can break human bones. A belted occupant in a car crash at 30 g could sustain broken ribs when held by the seat belt. Humans can tolerate localized g-forces in the 100s of g's for a split second, such as a slap to the face. Sustained forces above about 10 g can be deadly or lead to permanent injury.

For context, consider the following g-forces:
0.75 g - Automobile braking
0.88 g - Flopping into a chair
1.48 g - Driving up a curb
1.80 g - Steep Climb in Airbus A300
3.00 g - Sneeze
3.50 g - Cough
4.00 g - Slap on the back
4.50 g - Titan Roller Coaster (Six Flags Theme Park)
5.00 g - NASCAR vehicle on turn
10.0 g - Car crash that can break human bones
30.0 g - Ribs can be broken by seat belt
50.0 g - Death or serious injury

For safety, police demonstrate the beneficial use of a seatbelt. The videos below show the occupant kinematics experienced in a casual 5.0-7.0 mph collision: Video 1, Video 2.

3RD PARTY (OTHER VEHICLE) INJURY RISK

This section provides a lead indicator for relative 3rd party (other vehicle) injury risk based on accident reconstruction principles including conservation of momentum and relative vehicle mass (Delta V2 (Change in velocity) = Delta V1 * M1 / M2). The calculation does not require the vehicles reach a common post-impact velocity. Calculated injury risk applies only to the occupants in another passenger vehicle or light truck as shown and not to any struck pedestrian or cyclist (bicycle or motorcycle).

MOST RECENT EVENT(S)

If the claim under investigation is related to the most recent detected event, the probability of injury would be as follows and would depend on the other vehicle's weight and the crash type:

If the other vehicle is a Compact Car:

Example: Honda Civic, Hyundai Elantra
Assumed vehicle weight: 3190 lb. Assumed delta-V: 12.21 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Occupants in Frontal Impact	29% (Possible)	14% (Unlikely)	1% (Improbable)
Rear-ended Occupants	59% (Likely)	22% (Possible)	1% (Improbable)
Occupants in Side Impact	59% (Likely)	22% (Possible)	1% (Improbable)

If the other vehicle is a Midsize Car:

Example: Toyota Camry, Volkswagen Passat
Assumed vehicle weight: 3630 lb. Assumed delta-V: 10.73 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Occupants in Frontal Impact	27% (Possible)	12% (Unlikely)	1% (Improbable)
Rear-ended Occupants	51% (Likely)	20% (Possible)	1% (Improbable)
Occupants in Side Impact	51% (Likely)	20% (Possible)	1% (Improbable)

If the other vehicle is a Van/SUV/Light Truck:

Example: Dodge Grand Caravan, Ford F-150
Assumed vehicle weight: 5170 lb. Assumed delta-V: 7.54 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Occupants in Frontal Impact	22% (Possible)	7% (Unlikely)	1% (Improbable)

Rear-ended Occupants	49% (Possible)	11% (Unlikely)	1% (Improbable)
Occupants in Side Impact	49% (Possible)	11% (Unlikely)	1% (Improbable)

If the other vehicle is a Full Size Truck/SUV:

Example: RAM 2500, GMC Yukon
Assumed vehicle weight: 6050 lb. Assumed delta-V: 6.44 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Occupants in Frontal Impact	20% (Possible)	4% (Improbable)	0% (Improbable)
Rear-ended Occupants	41% (Possible)	9% (Unlikely)	0% (Improbable)
Occupants in Side Impact	41% (Possible)	9% (Unlikely)	0% (Improbable)

LOW VELOCITY IMPACT

If the claim under investigation is related to a recent Low Velocity Impact; the probability of injury would be as follows and would depend on the other vehicle's weight and the crash type.

If the other vehicle is a Compact Car:

Example: Honda Civic, Hyundai Elantra
Assumed vehicle weight: 3190 lb. Assumed delta-V: 5.14 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Occupants in Frontal Impact	17% (Unlikely)	3% (Improbable)	0% (Improbable)
Rear-ended Occupants	34% (Possible)	7% (Unlikely)	0% (Improbable)
Occupants in Side Impact	34% (Possible)	7% (Unlikely)	0% (Improbable)

If the other vehicle is a Midsize Car:

Example: Toyota Camry, Volkswagen Passat
Assumed vehicle weight: 3630 lb. Assumed delta-V: 4.52 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Occupants in Frontal Impact	15% (Unlikely)	3% (Improbable)	0% (Improbable)
Rear-ended Occupants	30% (Possible)	6% (Unlikely)	0% (Improbable)

Occupants in Side Impact	30% (Possible)	6% (Unlikely)	0% (Improbable)

If the other vehicle is a Van/SUV/Light Truck:

Example: Dodge Grand Caravan, Ford F-150
Assumed vehicle weight: 5170 lb. Assumed delta-V: 3.17 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Occupants in Frontal Impact	11% (Unlikely)	2% (Improbable)	0% (Improbable)
Rear-ended Occupants	19% (Unlikely)	4% (Improbable)	0% (Improbable)
Occupants in Side Impact	19% (Unlikely)	4% (Improbable)	0% (Improbable)

If the other vehicle is a Full Size Truck/SUV:

Example: RAM 2500, GMC Yukon
Assumed vehicle weight: 6050 lb. Assumed delta-V: 2.71 mph

Occupant Detail	Statistical Likelihood of Minor Injury Symptoms	Statistical Likelihood of Moderate Injury	Risk of Serious Injury
Occupants in Frontal Impact	10% (Unlikely)	0% (Not Present)	0% (Improbable)
Rear-ended Occupants	15% (Unlikely)	2% (Improbable)	0% (Improbable)
Occupants in Side Impact	15% (Unlikely)	2% (Improbable)	0% (Improbable)

POTENTIAL RECALLS / SAFETY / DIAGNOSTIC SCAN DATA

This section lists any potential outstanding recalls, known safety ratings & issues, retrieved DTCs (Diagnostic Trouble Codes), and respective Freeze Frame impact data, if any.

Potential Safety Recalls

Vehicle safety recall information is received from Transport Canada and includes all known recalls associated with this particular vehicle model. Any listed recalls are potential recalls which can be verified as outstanding or not by providing the VIN to a local dealer's service department.

Recal Date: 2018-11-02
Recall Number: 2018606
Affected System: Engine
Description: On certain vehicles, the engine valve springs could fracture, causing an engine failure or a stall with an inability to restart. This could increase the risk of a crash causing injury and/or damage to property.
Correction: Dealers will replace the engine valve springs.
Note: A driver may notice abnormal noise and/or vibration prior to an engine failure or stalling.

Recal Date: 2019-03-01
Recall Number: 2019104
Affected System: Brakes
Description: Issue: On certain vehicles, the brake lamp switch could fail. This would cause the brake lamps not to turn on when the brakes are applied. Depending on the model, this could cause an inability to shift from park or to start using the push-button ignition. This may also cause problems with the following: anti-lock brake system (ABS), vehicle dynamics control (VDC), and/or Eyesight system. Safety Risk: If the brake lights do not work, a following driver may not to recognize that a vehicle ahead is braking, increasing the risk of crash. Corrective Actions: The company will notify owners by mail. Owners will be instructed to take their vehicle to a dealer to have the brake lamp switch replaced.

Recal Date: 2019-04-18
Recall Number: 2019191
Affected System: Electrical
Description: Issue: A problem with certain replacement ignition switches may allow the key turn out of the "ON" position while driving. This could cause the engine to turn off suddenly. It could also cause the airbag system not to work properly in a crash. Note: This is a voluntary service campaign that is not being conducted under the requirements of the Motor Vehicle Safety Act. This problem only affects certain parts used for replacement of original parts. Safety Risk: A sudden loss of engine power could increase the risk of a crash. An airbag system that does not work properly in a crash could cause an increased risk of injuries. Corrective Actions: The company will notify owners by mail and instruct them to take their vehicle to a dealer to inspect the ignition switch, and replace it as necessary.

Diagnostic Trouble Codes (DTCs)

Diagnostic Trouble Codes (DTCs) are set by a control module when it detects faults in its system through self-diagnostics. The following section lists DTCs retrieved from various control modules of the vehicle.

Engine Control Module (ECM) — **1 Codes Found: U0155**

Error Code: U0155
Definition: Unknown DTC

Transmission Control Module (TCM) — **3 Codes Found: U0073, U0100, U0122**

Error Code: U0073
Definition: Unknown DTC

Error Code: U0100
Definition: Unknown DTC

Error Code: U0122
Definition: Unknown DTC

Freeze Frame Data

Freeze Frame Data refers to a snapshot taken by a control module when it detects a fault in its system. The snapshot consists of measured values from various sensors and can be useful in determining the root cause of the fault. Note that not all vehicles support the items listed below and thus some values may be inaccurate.

DTC	Engine RPM	Vehicle Speed	Throttle Position	Distance Travelled
U0155	807	0 mph	15 %	N/A
U0122	791	0 mph	N/A	N/A

EXPOSURE / AUTO PHYSICAL DAMAGES

This section provides predictive loss and repair estimate/cost information. AI inputs: Trusted Repair Estimates, Max Delta-V, Impact Angle, Vehicle Model/Specs (weight, stiffness), Airbag Deployment status, DTCs, Damage Area/Level/Photographs (if any).

Repair Estimate (AI Prediction)	Salvage Value (80% of Market Value)	Prediction: Total Loss / Repairable	Value Certainty
USD $15,500.00	N/A	N/A	N/A

VIN HISTORY

The information used to compile this vehicle history section is aggregated from various government agencies, non-profit organizations, and industry sources. Access to the National Motor Vehicle Title Information System (NMVTIS) is facilitated through VinAudit Inc., an Approved NMVTIS Data Provider.

Title Records

This section lists title records associated with this VIN.

Date	State of Title	Type	Mileage
2020-06-26	Massachusetts	Current	27 miles
2014-11-28	Massachusetts	Historical	27 miles

How To Interpret This Information

The National Motor Vehicle Title Information System (NMVTIS) is an electronic system that contains information

on certain automobiles titled in the United States. NMVTIS is intended to serve as a reliable source of title and brand history for automobiles, but it does not contain detailed information regarding a vehicle's repair history. All states, insurance companies, and junk and salvage yards are required by federal law to regularly report information to NMVTIS. However, NMVTIS does not contain information on all motor vehicles in the United States because some states are not yet providing their vehicle data to the system. Currently, the data provided to NMVTIS by states is provided in a variety of time frames; while some states report and update NMVTIS data in "real-time" (as title transactions occur), other states send updates less frequently, such as once every 24 hours or within a period of days. Information on previous, significant vehicle damage may not be included in the system if the vehicle was never determined by an insurance company (or other appropriate entity) to be a "total loss" or branded by a state titling agency. Conversely, an insurance carrier may be required to report a "total loss" even if the vehicle's titling-state has not determined the vehicle to be "salvage" or "junk." A vehicle history report is NOT a substitute for an independent vehicle inspection. Before making a decision to purchase a vehicle, consumers are strongly encouraged to also obtain an independent vehicle inspection to ensure the vehicle does not have hidden damage.

The Approved NMVTIS Data Providers (look for the NMVTIS logo) can include vehicle condition data from sources other than NMVTIS. NMVTIS data includes (as available by those entities required to report to the System):

- Information from participating state motor vehicle titling agencies.
- Information on automobiles, buses, trucks, motorcycles, recreational vehicles, motor homes, and tractors. NMVTIS may not currently include commercial vehicles if those vehicles are not included in a state's primary database for title records (in some states, those vehicles are managed by a separate state agency), although these records may be added at a later time.
- Information on "brands" applied to vehicles provided by participating state motor vehicle titling agencies. Brand types and definitions vary by state, but may provide useful information about the condition or prior use of the vehicle.
- Most recent odometer reading in the state's title record.
- Information from insurance companies, and auto recyclers, including junk and salvage yards, that is required by law to be reported to the system, beginning March 31, 2009. This information will include if the vehicle was determined to be a "total loss" by an insurance carrier.
- Information from junk and salvage yards receiving a "cash for clunker" vehicle traded-in under the Consumer Assistance to Recycle and Save Act of 2009 (CARS) Program.

Consumers are advised to visit www.vehiclehistory.gov for details on how to interpret the information in the system and understand the meaning of various labels applied to vehicles by the participating state motor vehicle titling agencies.

Disclaimer: The accuracy and reliability of the information supplied depends primarily on the reporting sources, and all entities involved in compiling this report accept no liability for any errors or omissions. Furthermore, all warranties, expressed or implied, including any implied warranties of merchantability or fitness for a particular purpose are hereby disclaimed.

VEHICLE SPECIFICATIONS

This section lists basic vehicle details encoded by the VIN.

VIN	JF1GPAS64EH******	**Year**	2014
Make	Subaru	**Model**	Impreza
Trim	Sport 5-Door-Limited+S/R	**Engine**	2.0-L H-4 DOHC 16V
Made In	Japan	**Style**	N/A
Steering Type	Rack & Pinion	**Anti-Lock Brakes**	4-Wheel ABS
Fuel Type	Regular Unleaded	**Fuel Capacity**	14.50 gallons
Overall Length	173.80 inches	**Overall Width**	68.50 inches
Overall Height	57.90 inches	**Standard Seating**	5
Curb Weight	3109 lb	**Gross Weight**	N/A
Highway Mileage	36 miles/gallon	**City Mileage**	27 miles/gallon

Invoice Price	$21,978	**MSRP**	$23,195

Event Data Disclaimer

It is important to note is that if a vehicle was spinning or rolling surrounding the collision, then the report's speed measurements would not accurately reflect the actual speed of the vehicle during/after it lost control; the speed measurement is typically based on the wheel speed sensor. Signs of this type of anomaly would be rapid changes in speed between the brief timing intervals. The reported speed may be an average of the four wheels; thus could also be skewed by spinning wheels. In combination with scene evidence, an expert could assess vehicle speed by analyzing the data via accident reconstruction and engineering analysis.

Users of the Collision Sciences service and reviewers of the reports and exported data shall ensure that data and information supplied is applicable to the vehicle, vehicle's system(s) and the vehicle ECU. Collision Sciences Inc. and all its directors, officers, employees and members shall not be liable for damages arising out of or related to incorrect, incomplete or misinterpreted software and/or data. Collision Sciences Inc. expressly excludes all liability for incidental, consequential, special or punitive damages arising from or related to the online services, evidence logistics, EDR data, EDR software or use thereof.

Injury Risk / Biomechanical Assessment Disclaimer

The estimated injury risks are calculated based on the recorded crash pulse, relative energy changes, known vehicle characteristics in standardized and real-world crashes, published databases, and recognized studies. The provided information can be used as a guide in settlement decisions but cannot be used to definitively prove the existence or non-presence of an injury. In cases with a very low risk of whiplash or other injury, claims can be identified for further investigation. Conversely, for cases with a high risk of whiplash or other injury, the claim can be expedited, since early treatment is often effective in reducing the long term prognosis.

Delta-V (Change in Velocity) has traditionally been used to correlate crash severity with risk of occupant injury (Augenstein et al., 2003; Bahouth et al., 2004; Sunnevång et al., 2009; Kononen et al., 2011). Injury tolerance and risk for various injury types based on real-world crashes with recorded crash data have been established (Gabauer and Gabler, 2006; Gabauer and Gabler, 2008; Kullgren and Krafft, 2008; Ydenius, 2010). Large-scale retrospective studies have also examined the relationship between minor severity crashes and the risk of occupant whiplash complaints, including studies in the U.S. (Tencer et al., 2001), Germany (Eis et al., 2005; Hell et al., 2002) and Sweden (Krafft et al., 2005). Injury risk studies consider the following risk factors: Crash configuration (front, side, rear, rollover), Delta-V = Change in velocity, Vehicle mass (size, weight), Vehicle stiffness, Vehicle geometry and engagement, Restraint system and its adjustment, Occupant seated position, Occupant profile (age, gender, previous injury), Number of WAD symptoms, and Psychological Distress. Structural damage and known whiplash thresholds overlap, indicating structural damage and repair cost are a poor predictor of minor injury threshold. Damage can also vary widely by vehicle model and impact configuration.

IMPORTANT NOTICE: Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

CDR File Information

User Entered VIN	JF1GPAS64EH334872
User	
Case Number	
EDR Data Imaging Date	06/30/2020
Crash Date	
Filename Saved on	JF1GPAS64EH334872_ACM 2014 SUBARU IMPREZA.CDRX Tuesday, June 30 2020 at 14:23:04
Imaged with CDR version	Crash Data Retrieval Tool 19.4
Imaged with Software Licensed to (Company Name)	Collision Sciences
Reported with CDR version	Crash Data Retrieval Tool 19.4
Reported with Software Licensed to (Company Name)	Collision Sciences
EDR Device Type	Airbag Control Module
Event(s) recovered	Frontal / Rear Crash (Record 2)

Comments

No comments entered.

Data Limitations

CDR Record Information:

1. Due to limitations of the data recorded by the airbag ECU, such as the resolution, data range, sampling interval, time period of the recording, and the items recorded, the information provided by this data may not be sufficient to capture the entire crash.

2. Pre-Crash data is recorded in discrete intervals.
Due to different refresh rates within the vehicle's electronics, the data recorded may not be synchronous to each other.

3.Airbag ECU data should be used in conjunction with other physical evidence obtained from the vehicle and the surrounding circumstances.

4. If the airbags did not deploy or the pretensioners did not operate during an event that meets a specified recording threshold, it is called a Non-Deployment Event. Data from a Non-Deployment Event can be overwritten by a succeeding event that meets the specified recording threshold. If the airbag(s) deploy or the pretensioners are operated, it is called a Deployment Event.
Deployment Event data cannot be overwritten or deleted by the airbag ECU following that event.

5. If power supply to the airbag ECU is lost during an event, all or part of the data may not be recorded.

6. The Subaru Select Monitor 3 or Subaru Select Monitor 4 can be used to obtain detailed information on the diagnostic trouble codes from the airbag system , as well as diagnostic information from other systems.

General Information:

1. The airbag ECU records data for all or some of the following accident types: frontal crash, rear crash , side crash, and rollover events. Depending on the installed airbag ECU, data for side crash and/or rollover events may not be recorded.

2. This airbag ECU records data before crash and data after crash - When a single event occurs independently, the data of this event is recorded one to one.
- When multiple events occur consecutively, information on two crash events can be recorded in one storage space.

3. The airbag ECU has two recording pages for each accident type: two pages for frontal and rear crash, two pages for a side crash, two pages for rollover event(*), and two pages for pedestrian crash(*).
*if equipped

4. The data recorded by the airbag ECU includes correlating information between each previously occurring event (i.e., information that clarifies the collision event sequence.

5. In frontal and rear collision events, the first point where a longitudinal cumulative delta-V of over 0.8 km/h (0.5 mph) is reached is regarded as time zero for the recorded data.

In side collision events, the first point where a lateral cumulative delta-V of over 0.8 km/h (0.5 mph) is reached is regarded as time zero for the recorded data.

Date:	Thursday, March 5 2020 05:09 PM
Subject:	FW: Collision Sciences Technology
From:	Merolli, Michael <mmerolli@mapfreusa.com>
To:	Scott Baker <sbaker@crashdatagroup.com>; Rose Bill (AA-AS/PAO11) <Bill.Rose@us.bosch.com>; Rusty Haight <rustyhaight@att.net>;
Attachments:	Collision Sciences Overview - INSURANCE BROCHURE & Letter.pdf; EDR Cost-Benefit Analysis (Collision Sciences).pdf; Collision Sciences - Service_Value Slide Deck - Sample Report Examples.pdf; ManagementReport_Sample.pdf; [Case CS-00535] 20190607 Claims 2014 Jeep Cherokee_Sample Report.pdf

Sent from my Verizon, Samsung Galaxy smartphone

------- Original message -------
From: Jason from Collision Sciences <jbayley@collisionsciences.ca >
Date: 3/5/20 11:37 AM (GMT-05:00)
To: "Merolli, Michael" <mmerolli@mapfreusa.com >
Subject: Collision Sciences Technology

Hi Mike,

I"m providing you some resources to review.

Please send me your shipping address and I'll send over a few kits for you to test out.

Have a great day,

Jason

Attachments:

- Service/Value Slide Deck, with sample report screenshots
- Cost-benefit document (includes an EDR Report Comparison (Bosch CDR vs CSI Claims)
- Supported Vehicle List (general, by make and year, the online lookup provides specific models and data limitations)
- Sample Report (relatively new, includes VIN History information)
- Sample Management Report

Our solution is unique for a number of reasons:

Hrg. EX. 032

Affordable hardware, CrashScan even supports vehicles not supported by Bosch CDR (Hyundai, Kia, Jag-Land

- Report format is easy to read, can save trained EDR users 4-6 hrs (multiple crash events, complicated EDR reports
- Free proactive data preservation (appraisers, shops), opportunity to be alerted by email (or Claim Centre) on flags
- Reports are customizable and inclusive of additional aggregated data (full diagnostic health scan data (DTC meanin
- We are capable of generating the "OEM" interpretation version of the report in our lab (i.e. Bosch CDR reports)
- We are working on an Accident Recon workup with calculations and raw data (an included supplemental report)
- Report fees are inclusive of engineering support by phone/email (for answering general questions, support for

Jason Bayley, P.Eng.
Collision Sciences | CEO & Founder
M: +1 905 599 9899
www.collision-sciences.com | CrashScan™ on Android and iOS | EDR Vehicle Support

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AMERICAN ARBITRATION ASSOCIATION AND
INTERNATIONAL CENTRE FOR DISPUTE RESOLUTION
COMMERCIAL ARBITRATION RULES

Bosch Automotive Service Solutions Inc. Claimant, -vs- Collision Sciences Inc. Respondent.	Case Number: 01-21-0016-2306 **Arbitrator: Thomas W. Cranmer**

EXPERT REPORT OF JOSHUA HELFINSIEGEL

In accordance with Fed. R. Civ. P. 26(a)(2), the following is my written report describing the subject matter areas, background, and opinions about which I expect to testify in the present litigation if called upon to do so.

Hrg. EX. 38

I. TABLE OF CONTENTS

II. TABLE OF ATTACHMENTS

Attachment 1 CV of Joshua HelfinSiegel

Attachment 2 Materials Considered

III. QUALIFICATIONS AND COMPENSATION

1. I, Joshua HelfinSiegel, am above the age of 18 years old and the following statements are based on my professional knowledge and personal experience.

2. I have a Bachelor's degree in Computer Science and a Certificate in Bioinformatics and Modeling from Wesleyan University, and have been an EnCase Certified Examiner in computer forensics since 2012.

3. I am currently employed by DisputeSoft as a Systems Administrator and I.T. Consultant. I have over sixteen years of experience in IT systems administration, database management, security, software and hardware support. Additionally, I have served as a technical and forensic investigation consultant in various complex litigation matters for more than ten years at DisputeSoft, with a focus on matters involving intellectual property rights and software implementation failures.

4. Particularly relevant here, I have performed forensic analyses, source code comparisons, and audits for various types of intellectual property disputes over many years working at DisputeSoft, searching for evidence of copying or misuse related to alleged trade secret misappropriation, copyright infringement, patent infringement, and breach of license claims. I have searched for evidence of literal and non-literal copying, as well as for the presence or absence of trade secrets and patented systems or methods within source code. My practical experience is described in my curriculum vitae, a true and correct copy of which is attached and incorporated hereto as Attachment 1.

5. I am being compensated at the rate of $390 per hour for the work I have performed on behalf of Bosch Automotive Service Solutions ("Bosch") for this matter. My compensation is in no way contingent on my findings herein or on the outcome of this matter.

6. I am the person solely responsible for the opinions contained in this report. I have been assisted in this matter by DisputeSoft personnel. All analysis and other assistance in connection with the preparation of this report was performed and provided by me or by DisputeSoft staff under my supervision and direction. References to "I" or "me" refer to both myself and the staff members who assisted me in preparing this report. All opinions expressed in this report are mine alone.

IV. SCOPE OF WORK

7. I have been retained by Bosch Automotive Service Solutions Inc. ("Bosch" or "Claimant") to act as an independent technical expert in this suit brought against Respondent Collision Sciences Inc. ("CSI" or "Respondent"). Specifically, I have been requested to review and analyze CSI's corporate computer, software code repositories, and cloud storage locations (collectively the "Audit Systems"), in addition to the documentary record for this matter. I have been requested to provide opinions related to the following questions:

7.1. How is the Bosch CDR Software related to Respondent's "CDR Replay" tool;

7.2. Does Respondent's "CDR Replay" tool allow the Bosch CDR Software to run while not connected to a car;

7.3. Is there evidence indicating the presence and/or use of the Bosch CDR Software by Respondent in the Audit Systems or documentary record that appear outside the scope of the time period described by Respondent's software licenses; and

7.4. Is there evidence in the documentary record that Respondent "reverse engineered" the Bosch CDR Software, and/or does Respondent utilize data extracted from the Bosch CDR Software or utilize the Bosch CDR Software itself to update new vehicles in Respondent's CrashScan software?

8. I have also been retained to supplement my findings based on any additional evidence or reports provided on behalf of Respondent.

9. Pursuant to Paragraph 10 of the April 20, 2022 Order on Software Audit, I captured all activities performed on the Audit Systems using the freely-available Open Broadcaster Software tool for screen recording.[1] I periodically refer herein to the capture videos using the

[1] More information on Open Broadcaster Software available at https://obsproject.com.

following designation: [hour:minutes] in the [MM-DD-YYYY] Capture Video. These videos were previously provided in native format as Attachment 4 to my July 31, 2023 Audit Report.

V. MATERIALS CONSIDERED

10. The opinions I express in this report are based on my review of the documents and materials listed throughout this report. The materials I have relied upon include:

10.1. The Demand for Arbitration, dated August 20, 2021;

10.2. Order on Software Audit, dated April 20, 2022;

10.3. Respondent's Explanations Pursuant to Paragraph 8 of Audit Protocol Order;

10.4. The End User License Agreements ("EULA") for versions 17.3 – 17.7 of the Bosch CDR Software (BOSCH002827);

10.5. The EULA for versions 17.8 – 18.1 of the Bosch CDR Software (BOSCH002795);

10.6. The End User License Agreements ("EULA") for the Bosch CDR Software, dated May 30, 2019 (BOSCH000082);

10.7. The July 31, 2023 HelfinSiegel Audit Report ("Audit Report");

10.8. Produced documents:

10.8.1. CS00437680-694 ("Development Notes");

10.8.2. CS00016681-83 ("Text of CDR.au3"); and

10.8.3. CS00444978 and CS00013052, emails referencing a "cdr-replay-controller" repository;

10.8.4. The Work Logs of Brian Chang-Yun Hsu ("Hsu Work Logs") (CS00018013, CS00507284, CS00510281, CS00510310, and CS00514207);

10.9. Excerpts from the October 18, 2023 Deposition of Brian Chang-Yun Hsu ("Hsu Transcript") as cited in this report;

10.10. Crash Data Group Sales Receipts to Respondent for one-year subscriptions to

Bosch CDR Software dated October 27, 2015 (BOSCH000923), January 26, 2018 (BOSCH000924) and July 9, 2019 (BOSCH000105);

10.11. Remote access to the Audit Systems, comprised of:

10.11.1. What I believe to be a clone of a laptop computer system used by Brian Hsu, developer for Respondent (the "Laptop");

10.11.1. Three source code repositories, hosted on Bitbucket for CSI, named "cdrservice"; "cdr-bluetooth-app-ios"; and "cdrbluetoothapp-android"; collectively the "CSI Code Repositories";

10.11.2. An Amazon Web Services account of CSI, including systems and databases hosted in Ohio, Northern California, and Canada;

10.12. The documents listed in Attachment 2 attached hereto and footnote citations throughout this report.

11. My opinions are based upon search, review, and analysis of these materials, as well as my education, training, and experience, to conduct analyses and reach the findings detailed in this report with a reasonable degree of professional certainty.

12. I understand that discovery is still ongoing. I reserve the right to consider any additional information or materials that may be provided to me or that are relied upon by any experts or fact witnesses, if called upon to testify or provide additional opinions regarding this matter.

13. I anticipate being called as a technical expert witness for Bosch at trial. I reserve the right to supplement or amend my opinions in light of any additional information that becomes available prior to or at trial.

VI. SUMMARY OF OPINIONS

14. Based upon my review and analysis, as well as my education, training and experience, I have reached with a reasonable degree of professional certainty the following opinions, as further described in the remainder of this report:

14.1. **Respondent's "CDR Replay" tool is based on and incorporates Bosch's CDR Software.**

14.1.1. Respondent's "CDR Replay" tool was created and used to simulate the information sent to and from the Bosch CDR Software that occurs during a car crash scan, without actually needing to connect to a real vehicle. Respondent created: 1) scripts to automate the running of the Bosch CDR Software based on a "trace" file captured from a vehicle; 2) software and hardware to mimic or mock up a connection to a real car; and 3) utilized the BUSMASTER software to "eavesdrop" on the messages sent to and from the Bosch CDR Software as part of its "CDR Replay" tool. This new "CDR Replay" tool is improperly based on and incorporates the Bosch CDR Software. This is relevant to the current matter, as it is my understanding from counsel and from previous engagements that one work based upon another could potentially be considered a derivative work, and each of the three EULAs I have reviewed contain text reserving the right to create derivative works of the Bosch CDR software. [2]

[2] BOSCH002827 and BOSCH002795 section 1.3:

"Licensor reserves all rights for the Licensed Software, in particular exclusive right to reproduce, to distribute, to prepare derivative works therefrom and to publicly display Licensed Software."

BOSCH000082 section 2.4:

14.2. **Respondent's "CDR Replay" tool runs the Bosch CDR software without a connection to a real car.**

14.2.1. As stated above, Respondent's "CDR Replay" tool was created and used to simulate the information sent to and from the Bosch CDR Software that occurs during a car crash scan, without actually needing to connect to a real vehicle.[3] This is relevant as the May 30, 2019 EULA for version 19.0 or later of the Bosch CDR Software states: "Connections to vehicles or electronic control units (ECU) for the purposes of retrieving data must be done by directly connect the CDR tool to the vehicle or ECU using CDR tool cables and/or adaptors approved by Bosch."[4] There is evidence on the Laptop and in the documentary record that indicates that versions 19.0 and later of the Bosch CDR Software were run while not connected to a car or ECU as part of Respondent's "CDR Replay" tool.

14.3. **BOSCH CDR Software versions that were installed on the Laptop appear to be outside of the time periods described by Respondent's software licenses.**

14.3.1. My Software Audit revealed that versions of the Bosch CDR Software were installed at least 325 times on the Laptop.[5] The installations included at least

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"Bosch reserves all rights for the Software, in particular exclusive right to reproduce, to distribute, to prepare derivative works therefrom and to publicly display the Software."

[3] CS00484086, a February 21, 2018 email from Brian Hsu, "The attached PDF is the report for your car. Raw data from the scan are stored in the database on the server, so I can use those data and "replay" back to the Bosch tool and make it generate a report."

[4] BOSCH000082, section 2.2.1:

"Connections to vehicles and or electronic control units (ECU) for the purposes of retrieving data must be done by directly connect the CDR tool to the vehicle or ECU using CDR tool cables and/or adaptors approved by Bosch. Any connections to a vehicle or ECU through additional hardware and software which is not part of the CDR tool is prohibited including, but not limited to, indirectly connecting the CDR tool through a wireless OBDII communications device, enabling remote connection to CDR tools over a server or internet server."

[5] *See* install logs for the Bosch CDR Software discovered in C:\Windows\appcompat\Programs\Install; dtSearch

versions 16.4, 19.4, 19.4.2, 19.5, 19.6, 21.0, 21.1, 21.2, 21.3, 21.4, and 21.5 of the Bosch CDR Software. The license agreements I have reviewed indicate that Respondent was allowed to use the Bosch CDR Software up through version 19.4, but not any versions after that. However, the Laptop indicates that subsequent versions of the Bosch CDR Software were installed. Additionally, the Laptop contained Bosch CDR Software license files for several versions of the Bosch CDR Software listing companies that were not Respondent, namely Street Delivery and Biologic Forensics.[6] The Bosch CDR Software version 21.5.1 "licensed to" StreetDelivery was run on the Laptop at least on one occasion, on July 19, 2022.[7] The documentary record also indicates further sharing of certificate files for the Bosch CDR Software between Respondent and StreetDelivery.[8] This sharing of certificate files is relevant, as it is my understanding from counsel that sections 2.1; 2.1.1; 2.1.2; 2.3; 2.3.6; 2.3.7; and 2.3.8 of the May 30, 2019 EULA address relevant authorized and prohibited usages of the Bosch CDR Software, with special focus on prohibitions related to transfer, competitive, or unauthorized usage.[9]

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hits from 345 to 670 are each install logs for the Bosch CDR Software; starting at approximately 4:24 PM in 8-16-2022 Capture Video.

[6] Located in the directories C:\Users\Brian\Documents\CDR Installation\ and C:\Users\Brian\Documents\CDR Installation\Supplier\; reviewed in videos 8-16-22 at approximately 3:21 pm; 8-25-2022 Capture Video at approximately 1:16 pm and 3:47 pm.

[7] *See* crash dump file C:\Users\Brian\AppData\Local\CrashDumps\CDR.EXE.9656 on July 19, 2022; reviewed in 8-25-2022 Capture Video at approximately 12:54 pm.

[8] CS00481806, CS00021283, CS00018832. Additionally, in the Hsu Transcript, 98:1-102:11, Mr. Hsu testified that collision.delivery@gmail.com was an email shared with StreetDelivery.

[9] May 30, 2019 EULA:

2.1. Your Authorized Use of the Software. Subject to your compliance with this EULA in all material respects:

2.1.1. If You are an individual person and you received an activation certificate ("Activation Certificate") pursuant to a Bosch CDR Tool software Subscription from Bosch or an approved CDR Tool reseller or distributor

14.4. **Respondent's CrashScan App provides similar crash scan and reporting functionality as the Bosch CDR Software, and leverages Respondent's "CDR Replay" tool incorporating the Bosch CDR Software to continually verify, correct, improve and refine its output.**

14.4.1. Respondent used a bus-sniffing tool named "BUSMASTER" (coincidentally also created by a Bosch-affiliated entity) to intercept and view the messages sent to and from the Bosch CDR Software. This information was used to extract and examine data transmitted to and from the Bosch CDR Software. This extracted data, along with the "CDR Replay" tool and Bosch CDR Reports generated by using the "CDR Replay" tool, were used to continually verify, correct, improve and refine the output of Respondent's own CrashScan software.[10] Respondent's CrashScan software and reports provide similar features and functions to that of the Bosch CDR software and its associated reports, and Respondents describe

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("Subscription"), Bosch grants You a personal, limited, non-exclusive, non-transferable, non-sublicensable, revocable license to use the Software, in object code form only, for the Purpose on the Designated Equipment. "Designated Equipment" shall mean no more than one personal computer per installation of the Software, such computer equipment to be identified by You as the equipment upon which You will be the primary user and intend the Software to be used.

2.1.2. If You are a company or any other type of organization, Bosch grants to You the right to designate one individual person within Your organization to have the non-exclusive right to exercise the rights set forth in Section 2.1.1.

2.3. Restrictions on Your Use of the Software. The Software or its components may be used only as expressly authorized in this EULA, and in no other way. You expressly agree NOT to:

2.3.6. Provide a copy of the Software to anyone who is not bound by this EULA, or permit, allow, or authorize any other person or entity who is not bound by this EULA to use the Software;

2.3.7. Use or permit any other person to use the Software in any way that competes with Bosch's products or services, except as expressly permitted by applicable law;

2.3.8. Attempt to transfer Your rights under this EULA, or delegate Your obligations under this EULA, without Bosch's express prior written permission.

[10] For examples, *see* Hsu Work Logs.

their own solution as a "direct replacement for the Bosch tool."[11] Based on common English language definitions, this effort could qualify as reverse engineering. Potential reverse engineering is relevant, as the May 30, 2019 EULA for the Bosch CDR Software describes a restriction to attempted reverse engineering.[12]

[11] CS00521635 generally; "Strategic Business Proposal", attached to a December 7, 2018 email from Jason Bayley to Tom Walsh (CS00521578). Specifically, CS00521638.
[12] BOSCH000082, section 2.3 and 2.3.1.

VII. FACTS AND BACKGROUND INFORMATION

A. Bosch's CDR Software

15. Bosch's marketing material states that since the year 2000, Bosch has used its CDR Software to retrieve data from Event Data Recorders ("EDR") installed as part of airbag or other safety systems on automotive vehicles. The Bosch CDR Software has been used to read the data stored on the EDR inside the vehicle, and provide CDR reports based on the data extracted from a vehicle after a car crash.[13]

16. By default, the Bosch CDR Software installs in a read-only mode; to unlock all of the function of the Bosch CDR Software, including vehicle scans, and printing and saving Bosch-branded CDR reports, a user must purchase a subscription for a one-year license.[14] More information on the software installation process, certificates, subscriptions and activation is available in the "Software Installation Guide" for the Bosch CDR Software.[15]

B. Respondent's CrashScan Software

17. CrashScan by CSI is marketed as a "universal, mobile-app-based EDR (Event Data Recorder) solution" that also includes "software required to extract all digital forensic data from supported vehicles," user training, and EDR Reports.[16]

18. A review of the code provided in CSI's online Bitbucket source code repositories revealed that the repositories appear to contain code related to Respondent's CrashScan application, broken up into three repositories: (1) the Server Application, which could be considered the engine of the application, appears to perform the majority of the functions of

[13] *See* https://cdr.boschdiagnostics.com/cdr/sites/cdr/files/15-93_cdr_crash_data_retrieval.pdf.
[14] Demand for Arbitration, p. 7.
[15] BOSCH002655.
[16] *See* https://www.collision-sciences.com/services.html.

the application, and contains the API; (2) the Android application, which appears to use the API to access the functionality of the Server Application; and (3) the iOS Application, which also appears to use the API to access the functionality of the Server Application.[17]

C. Relevant Licenses

19. Based on receipts I have seen from Crash Data Group it appears that Respondent purchased one-year licenses for the Bosch CDR Software on October 27, 2015, January 26, 2018, and July 9, 2019.[18] A one-year license allows the user to access and use the then current version of the software, and all future versions that are released during the one-year license term.[19]

20. I have reviewed the website at "https://cdr.boschdiagnostics.com/cdr/software-downloads", where information on official versions of the Bosch CDR Software are available, and more recent versions are available for download. The release date for each version is provided when a user clicks on a given software version number on the website, e.g., 19.6. The release dates gathered from the Bosch CDR Software download pages for each version of the Bosch CDR Software released since the date of Respondent's first license purchase are reflected in the table below.

Table 1: Bosch CDR Software Versions and Release Dates show on Bosch website

Bosch CDR Software Version	Date of Release
v23.1	03/31/2023
v23.0	10/7/2022
v21.5	4/8/2022
v21.4	1/5/2022
v21.3	10/28/2021

Bosch CDR Software Version	Date of Release
v21.2	8/3/2021
v21.1	5/14/2021
v21.0	1/21/2021
19.6	12/1/2020
v19.5	8/13/2020

[17] *See* also Item 6(c) of Respondent's Explanations Pursuant to Paragraph 8 of Audit Protocol Order.
[18] *See* BOSCH000923, BOSCH000924, and BOSCH000105, respectively.
[19] *See* https://cdr.boschdiagnostics.com/cdr/products/cdr-system-1-year-software-subscription.

Bosch CDR Software Version	Date of Release
v19.4	5/7/2020
v19.3	12/23/2019
v19.2	12/6/2019
v19.1	9/20/2019
v19.0	6/6/2019
18.0	2/20/2019[20]
v17.10	12/20/2018
v17.9	9/18/2018
v17.8	7/31/2018
v17.7	3/19/2018
v17.6	12/22/2017

Bosch CDR Software Version	Date of Release
v17.5	10/17/2017
v17.4	6/15/2017
v17.3	4/11/2017
v17.2	1/22/2017
v17.1	11/2/2016
v17.0	8/23/2016
v16.6	5/23/2016
v16.5	3/18/2016
v16.4	12/17/2015
v16.3	11/20/2015
v16.2	8/10/2015

21. Given the release dates above and that Respondents purchased one-year licenses from October 27, 2015 to October 27, 2016; January 26, 2018 to January 26, 2019; and July 9, 2019 to July 9, 2020, the versions available for download and installation during those time periods were versions 16.2 – 17.0; 17.6 – 17.10; and 19.0 – 19.4 of the Bosch CDR Software.

22. Based on the above and discussions with counsel, it is my understanding that three EULAs are relevant to Respondent's use of the Bosch CDR Software: 1) the EULA for versions 17.3 – 17.7; 2) the EULA for versions 17.8 – 18.1; and 3) the EULA dated May 30, 2019 for versions 19.0 and up.[21]

D. Definitions of Reverse Engineering

23. Reverse engineering can be defined several ways, "to disassemble and examine or analyze in detail (a product or device) to discover the concepts involved in manufacture usually in order to produce something similar,"[22] "the act of copying the product of another

[20] There appears to be a typo in the release year for version 18.0, as the previous version, 17.10, was release on December 20, 2018, and the software release details document shows a copyright notice in 2019.
[21] *See* BOSCH002827-831, BOSCH002795-799, and BOSCH000082-087.
[22] *See* https://www.merriam-webster.com/dictionary/reverse%20engineer.

company by looking carefully at how it is made,"[23] and "a process in which a product or system is analyzed in order to see how it works, so that a similar version of the product or system can be produced more cheaply,"[24] among others. In testimony, CSI's Chief Technology Officer, Brian Hsu, defined "reverse engineering" simply as "figuring out how something works."[25]

24. The key portions of these definitions appear to me to be: 1) detailed analysis or taking apart of a product to understand how it works; and 2) the end goal of creating a similar product.

[23] *See* https://dictionary.cambridge.org/us/dictionary/english/reverse-engineering.
[24] See https://www.collinsdictionary.com/us/dictionary/english/reverse-engineering.
[25] Hsu Transcript, Page 31:11-13.

VIII. OPINIONS AND ANALYSIS

A. Respondent has incorporated the Bosch CDR Software into their own "CDR Replay" tool.

25. Respondent has incorporated the Bosch CDR Software as part of their own "CDR Replay" tool. This is apparent from data on the Laptop, and an April 3, 2018 video demonstration of Respondent's "CDR Replay" tool which I discovered on the Laptop.[26] This is important and relevant as each of the three relevant EULAs state with regard to the Bosch CDR Software, that Claimant, "reserves all rights…to prepare derivative works therefrom."[27] This finding is also potentially relevant, as it is my understanding from counsel and from previous engagements that basing on or incorporating one software work into another one may qualify as a "derivative work".

26. As support, I incorporate by reference paragraphs 29 through 50 of the Audit Report, where I detail how Respondent incorporated the Bosch CDR Software into its own "CDR Replay" tool for remotely replaying car crash events using the Bosch CDR Software while not connected to a vehicle.[28] The process of using the "CDR Replay" tool is shown in the April 3, 2018 demonstration video found on the Laptop, "CDR Replay.wmv", and displays each component in use for the tool: A database, JSON "trace" data, the Bosch CDR Software, and the BUSMASTER software to intercept and view messages sent to and from the Bosch CDR Software.[29] The "CDR Replay" tool was also succinctly described in a "Summary of Code.pdf" file also found on the Laptop.[30]

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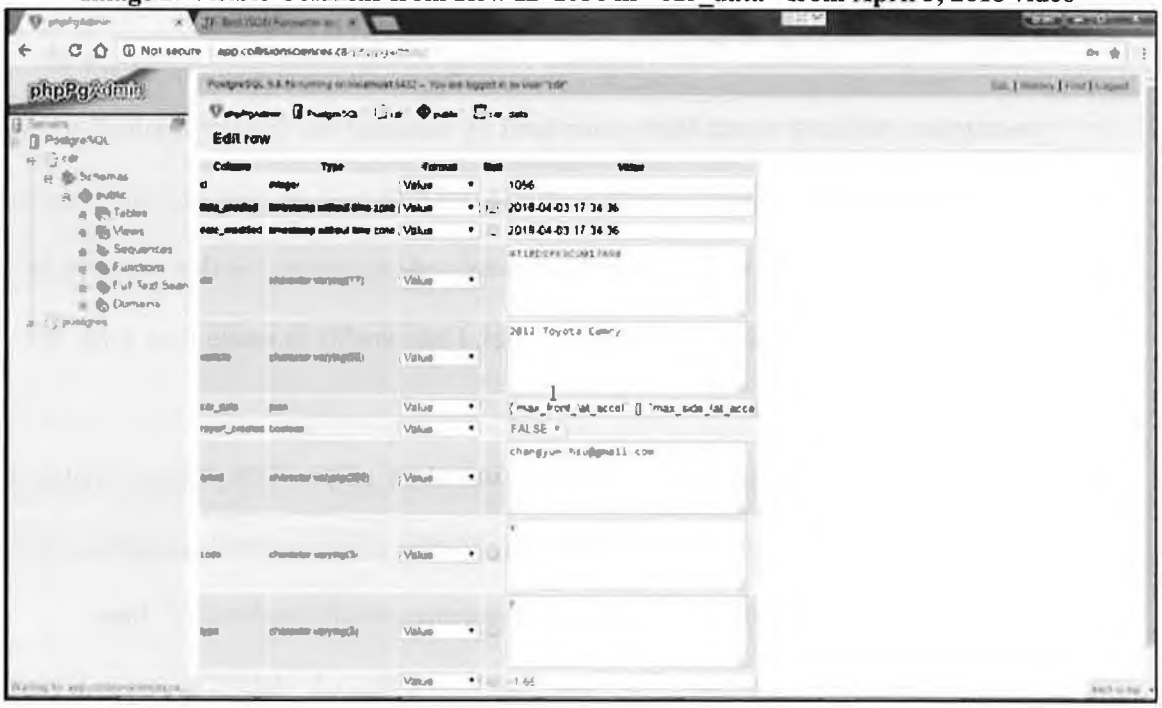
[26] CS00236930.
[27] BOSCH002827; BOSCH002795; BOSCH000082.
[28] Audit Report, pp. 18-34.
[29] This video was located in "C:\Users\Brian\Documents\Expression\Expression Encoder\Output\Brian-MBP 4-3-2018 2.20.25 PM\CDR Replay.wmv"
[30] CS00465053. This document was also located at C:\Users\Brian\Desktop\Desktop\SOURCE CODE\Summary of Code.pdf on the Laptop.

26.1. "CDR-Replay": The purpose of the contents of this folder is to "listen for Parameter Identification ("PID") requests coming from a Bosch unit." Based on the description, this code would likely have been for handling the "eavesdropping" portion described above in conjunction with the BUSMASTER tool, and playing back "traces" recorded from an actual vehicle scan. If a source code repository for this source code exists on Bitbucket for the "CDR-Replay" tool, I was unable to locate it, or it has not been made available to me.

26.2. I have also included representative screenshots of the "CDR Replay" tool in use captured from the April 3, 2018 "CDR Replay" video. The user first logs into a PostgreSQL database hosted at "app.collisionsciences.ca/phppgadmin/",[31] then navigates to the "cdr" database. The "cdr" database table "cdr_data" appears to contain JSON "trace" data "taken previously from a real car."

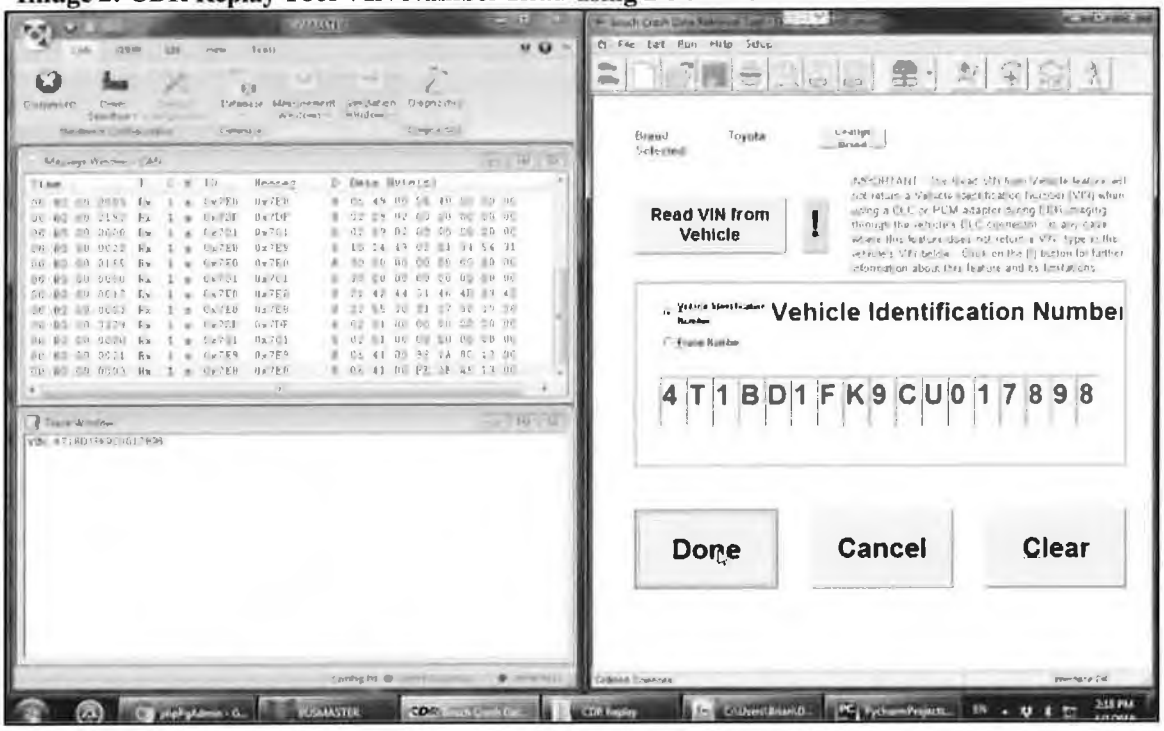
[31] Additional screenshot provided in CS00517424, "Black Box Crash Data: cloud-enabled" PPT presentation, slide 23. Web access and login instructions to the database shared in CS00448071, a December 8, 2017 email from Manjeet Singh Rangi.

Image 1: Visible Columns from Row ID 1056 in "cdr_data" from April 3, 2018 video



27. The user then copies the JSON "trace" data from the "cdr_data" field in the database, and then pastes it into a JSON formatter, then saves the formatted data into an "Input.json" file. This input "trace" file is further processed into a "Replay.txt" file using the "ReplayFileMaker.py" Python code. The user then saves out the Vehicle Identification Number ("VIN") to a "VIN.txt" file, opens the BUSMASTER and Bosch CDR Software programs, and runs the "CDR Replay" using the "Replay.txt" file and "VIN.txt" file as inputs to the program. A screenshot of what appears to be the "CDR Replay" tool reading the vehicle VIN number out of the "VIN.txt" file while not connected to a real vehicle, is shown below. Also note in the screenshot that the BUSMASTER software has successfully "eavesdropped" on the message sent to the Bosch CDR Software containing the VIN number, as shown in the bottom-left window.

Image 2: CDR Replay Tool VIN Number Read using BUSMASTER and Bosch CDR Software[32]



28. Additionally, my review of the documentary record and Respondent's Developer Notes[33] further indicate that the goal of the "CDR Replay" tool was to "'replay' one of [CSI's] crash data files into the Bosch CDR software." It appears that Respondent took two paths towards this end goal: the "CDR Replay" tool, and the "AutoCDR" tool; the "AutoCDR" tool "merely automates running the Bosch CDR software, using AutoIT."[34] As further support regarding the "AutoCDR" tool, I incorporate by reference paragraphs 54 through 56 of the Audit Report as well. As of April 17, 2018, at least, the Hsu Work Log indicates that AutoIT was still in use, with a time entry stating "Made ReplayFileMaker.py

[32] Similar screenshots provided in CS00517300. The output appears to be the result of running the file "ABM.cpp", which was written by Brian Hsu. The "ABM" in "ABM.cpp" is likely short for AirBag Module, *see* CS00016315.
[33] CS00437680
[34] CS00437680, also CS00538850: "The Auto IT (Car Crash Analysis) software DOES NOT have anything to do with HEX DATA/PIDs. ... All this AutoIT software does is automate mouse clicks and data entry ..."

and EEPROM.py into the same file, so that AutoIT only needs to run one file."[35] This "AutoCDR" tool is a work based on the Bosch CDR Software, and is relevant in that it may qualify in that respect as a derivative work.

29. With further regard to the "AutoCDR" tool, the Developer Notes also corroborate earlier findings and suspicions, stating that the "AutoCDR software was created separately (using AutoIT3)…(and the developer is named Thai and is still available)."[36] Also, "CarCrash[.exe] was a continuation of the software, in an attempt to use with a tablet and the green box in the field…to place a 'telematics' order to [Jason Bayley's] server prior to 'auto-running' the cdr software."[37] This evidence supports a finding that AutoCDR and CarCrash.exe were part of an attempt to automate the running of the Bosch CDR Software. Again, this is relevant, as both the "AutoCDR" tool and "CarCrash.exe" are works based on the Bosch CDR Software, and may qualify in that respect as derivative works.

30. This Developer Notes documents also appear to contain developer notes on progress related to the "CDR Replay" tool, and that as of May 30, 2016 it could extract PID data from a "trace" and "Play that back into the CDR." The telematics developer further writes, "It worked, and generated a report. As for security access, I can now get the CDR to give up its secrets. For Toyota, I have the algorithm figured out…The security key may change year to year, but that can be worked out."[38] Additionally, the document indicates that as of June 15, 2016 there was a plan to attempt to "use the Bosch CDR remotely," when vehicles were not supported by Respondent, record the "trace" for each new part, and that "would theoretically

[35] CS00018016.
[36] CS00437685.
[37] CS00437685.
[38] CS00437681.

let [CSI] support 100% of vehicles out of the gate."[39] As of June 29, 2016, a developer for Respondent was:

> [W]orking on full automation of the CDR report generation. This involved running the Bosch software automatically and playing recorded data into it. That's working now within a virtualized environment. The next step here is to poll the server for new reports, so the whole process is automated.[40]

31. Further, the "telematics project summary" describes a prototype and goal software of remotely reading PIDs from a vehicle, sending to a server, then having that data "played back into the Bosch lab hardware/software" to create reports, with the further goal to have a system that used a Bluetooth OBDII dongle and a mobile app to collect and send PID data to a server, replay the data into the Bosch CDR Software, and then automatically email a crash data report to the end user.[41] The "play back" of the data in the Bosch CDR Software is likely Respondents "CDR Replay" tool. The document additionally includes links to a hardware "CAN hack sniff/trace tool that [CSI] used. i.e., an OBDII to USB solution that monitors all CAN frames".[42]

32. The documentary record includes numerous emails related to the development of this "CDR Replay" tool. For example:

32.1. On May 12, 2017, Jason Bayley informs Jonathan Gomes, a newly hired full stack developer, to "keep in mind that [he] may need to determine what is missing to be able to 'replay' one of [CSI's] crash data files into the Bosch CDR software" and that "this process may require the scripts named 'fake cdr' or 'live cdr', while feeding a .json 'cdr replay' file."[43]

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[39] CS00437682.
[40] CS00437684.
[41] CS00437687.
[42] CS00437691.
[43] CS00437680.

32.2. Jason Bayley also emphasizes to Jonathan Gomes that "[his] ultimate hope is that [Jonathan] can FIRST figure out how to get [the GO and related code] to function, that is to 'play back' one of [CSI's] unique .json files into the Bosch software, with the linked code running."[44]

32.3. On May 18, 2017, Karpagam C.P, an independent contractor hired by Jason Bayley, writes that Jason "did mention that CDR software is similar/replica to Bosch software …"[45]

32.4. On May 18, 2017, Jason Bayley writes to Karpagam C.P and Jonathan Gomes that "The Bosch CDR Windows software handles the conversion of hex data (or pid responses?) into the pdf Crash Data Report. Maybe there is no actual hex data stored in a file, and we just feed the Bosch software responses to requests it makes..."[46]

32.5. On August 24, 2017, Jason Bayley writes to a person named Vladimir stating "I was working with an engineer who took traces of the Bosche [sic] system, by reverse engineering the process with a CAN bus sniffer, etc. We developed a mobile app and api to retreive [sic] event data on the vehicle side; we then ran the collected PIDs through the Bosche [sic] software/hardware, making it think it was plugged into a car. However, I am interested in making custom pdfs now. I recall you had experience turning hex data into pdfs, so I am wondering if you'd be interested in a project like this? I have a custom software for several manufacturers, and sample hex data shown on Bosche's [sic] cdr reports for many module types. There is a large amount of reverse engineering still to do as well."[47]

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[44] CS00471345.
[45] CS00449590.
[46] CS00538850.
[47] CS00534553.

32.6. On August 29, 2017, Jason Bayley writes to Craig Parker at Toyota explaining CSI's crash data work, stating "We have a working end-to-end prototype (Android app to server to vehicle/module emulator into the Bosch software to make pdf) for several manufacturers on CAN networks (Toyota, Ford, Chrysler, Nissan, VW) …"[48]

33. Respondent appears to have succeeded, as from late 2017 onwards, Respondent frequently references the ability to "Replay" data collected with its remote application into the Bosch CDR Tool.[49] It also appears that the process was working at least as of April 3, 2018, from the "CDR Replay" demonstration video.[50] The Work Logs of Mr. Hsu indicate continued usage of the "CDR Replay" tool as of May 2020, as will be discussed below in section D in detail.

34. In addition to the above, the documentary record contains what appear to be automated alert email messages to Brian Hsu containing the text "Check data decoding scheme with CDR replay,"[51] or, "Check data accuracy with CDR replay,"[52] from the time period between January 6, 2020 until as late as May 11, 2022. These alert emails suggest that the "CDR Replay" tool was still in use from early 2020 through at least May of 2022.

B. Respondent's "CDR Replay" tool runs the Bosch CDR software without a connection to a real car.

35. As described above and in my July 31, 2023 Audit Report, Respondent's "CDR Replay" tool allows the running or "replaying" of the Bosch CDR Software without a connection to a real car. For example, as previously discussed, Image 2 above depicts the

[48] CS00469075.
[49] *See, e.g.,* CS00521696, attached to email of April 9, 2019 (CS00521694) ("The tech has several components: Ability to Replay the raw crash data into Bosch CDR Tool").
[50] CS00236930.
[51] For example, CS00020037 email from May 11, 2022; CS00013984 email from April 5, 2022.
[52] For example, CS00019390 email from December 13, 2021; CS00021441 email from December 9, 2020; CS00015676 email from January 6, 2020.

Bosch CDR Software being used to read a vehicle VIN number from a "VIN.txt" file on a computer rather than from a vehicle. This is important and relevant as it is my understanding from the May 30, 2019 EULA and counsel that running version 19.0 or later of the Bosch CDR Software while not connected to a vehicle is a "prohibited" use for the Bosch CDR Software.[53] The April 3, 2018 "CDR Replay.wmv" video demonstrates that as of April 3, 2018, version 17.7 of the Bosch CDR Software was used as part of Respondent's "CDR Replay" tool.

36. There is evidence that Respondent continued to use CDR Replay for later versions of the Bosch CDR Software. Specifically, emails from CSI's CEO and CTO, Jason Bayley and Brian Hsu, respectively, involve discussions of creating and sending Bosch CDR reports using "replay", and attaching versions of the Bosch CDR Software's reports, generated using at least Bosch CDR Software versions 19.0, 19.1, 19.1.1, 19.2, 19.3.1, 19.4, for each of which the May 30, 2019 EULA should be relevant.

37. The emails are primarily sent by Jason Bayley, and on occasion refer to the Bosch CDR Software report as the "raw" data, as seen below. A non-exhaustive sample of the emails include text such as:

37.1. "Sending the replay version of CDR report,"[54] with a Bosch CDR Software version 19.0 CDR report attached.[55]

37.2. "Have the ability to generate these Bosch CDR reports in our lab…I'm

[53] BOSCH000082, section 2.2.1:

"Connections to vehicles and or electronic control units (ECU) for the purposes of retrieving data must be done by directly connect the CDR tool to the vehicle or ECU using CDR tool cables and/or adaptors approved by Bosch. Any connections to a vehicle or ECU through additional hardware and software which is not part of the CDR tool is prohibited including, but not limited to, indirectly connecting the CDR tool through a wireless OBDII communications device, enabling remote connection to CDR tools over a server or internet server."

[54] CS00448949 September 17, 2019 email.

[55] CS00448951.

attaching our version of the Bosch report (using the latest software version 19.0),"[56] with a Bosch CDR Software version 19.0 CDR report attached.[57]

37.3. "Did a replay into the Bosch CDR as the DeltaV is very high (70km/h) and I can confirm that this value matches the Bosch CDR report, which I have attached. I can explain further how we do this, but essentially, we send the Bosch tool the exact hex data from the EDR,"[58] with a Bosch CDR Software version 19.1 CDR report attached.[59]

37.4. "Hey, can you please do a replay…," and a response, "Here you go,"[60] from Brian Hsu with an attached Bosch CDR Software version 19.1 report.[61]

37.5. "I'm attaching the CS EDR Report (and our backend Bosch CDR),"[62] with a Bosch CDR Software version 19.1.1 CDR report attached.[63]

37.6. "Can you replay this one…" later response from Brian Hsu "The CDR report is attached," [64] with an attached Bosch CDR Software version 19.1.1 report.[65]

37.7. "I'm attaching our EDR Claims Report and the Bosch CDR interpretation report for this file,"[66] with a Bosch CDR Software version 19.2 CDR report attached.[67]

37.8. From Brian Hsu to Jason Bayley, "I have completed a data download from the airbag module…The generated Bosch CDR report is attached,"[68] with a Bosch CDR Software version 19.3.1 CDR report attached.[69]

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[56] CS00446031 September 18, 2019 email.
[57] CS00446035.
[58] CS00484345 September 20, 2019 email.
[59] CS00484347.
[60] CS00024812 September 25, 2019 email.
[61] CS00024814.
[62] CS00528869 November 19, 2019 email.
[63] CS00528880.
[64] CS00450468 November 22, 2019 email.
[65] CS00450471.
[66] CS00530586 December 9, 2019 email.
[67] CS00530588.
[68] CS00465392 February 25, 2020 email.
[69] CS00465393.

37.9. From Brian Hsu, "Here is the report containing the raw hexadecimal data,"[70] with a Bosch CDR Software version 19.3.1 CDR report attached.[71]

37.10. From Brian Hsu, "Please find the Bosch report for the vehicle attached,"[72] with a Bosch CDR Software version 19.4 CDR report attached.[73] Additionally, this report has an "imaging date" that is three months later than the "saved" or "printed" date, potentially indicative of the "CDR Replay" tool's use, since the imaging date would normally be prior or the same as the save or print date of a given Bosch CDR Software report.

37.11. On May 18, 2017, Jason Bayley writes to Karpagam C.P [sic] and Jonathan Gomes stating "What we need to focus on (and maybe Jonathon will understand better)... is "playing back" the .json files (while running some other app, like fake cdr? or live cdr?) which basically makes the Bosch hardware think its plugged into a vehicle or an airbag module."[74]

37.12. Jason Bayley also writes "For our telematics purposes now, the CDR Bosch software can have that order info (vehicle, VIN, date) entered manually (and then we click 'Run: Collect ACM Data'; it is at this point that we 'play back' our .json file; the Bosch CDR Harware/software [sic] thinks that it is plugged into either an airbag module or a vehicle."[75]

37.13. On August 24, 2017, Jason Bayley writes to a person named Vladimir stating "[CSI] developed a mobile app and api to retreive [sic] event data on the vehicle side;

[70] CS00448843 April 29, 2020 email.
[71] CS00448845.
[72] CS00457484 June 1, 2020 email.
[73] CS00457490.
[74] CS00538850.
[75] CS00538850.

[CSI] then ran the collected PIDs through the Bosche [sic] software/hardware, making it think it was plugged into a car."[76]

37.14. On September 29, 2017, in an email chain between Jason Bayley, Brian Hsu, and Renan Pedrosa on September 29, 2017:[77]

37.14.1. Brian Hsu writes "I went through the CAN data that we got off of my car yesterday, and it seems that, at least in this case, the CDR determined what commands to send based solely on the VIN. … So, I think we can trick the CDR to get us a bunch of information just by using randomly generated VINs that correspond to different vehicles."

37.14.2. Brian Hsu writes "What I have in mind:

1. Generate random VIN numbers
2. Send out the request to the CDR
3. Save all commands that the CDR sent out in a file.

This is essentially the database that we want.

4. Repeat for other vehicles"

37.14.3. With regards to using CAPL to write code, Brian Hsu writes "We can select the make, the year, and the model using the panel and then the program will automatically send out commands to a real car to get crash data. But for now, of course, the goal is to get those commands by tricking the Bosch CDR into thinking that it is talking to a real car."

37.14.4. With regards to using the CANalyzer software, Jason Bayley writes: "I mean, in theory all this will work... but in case this CANalyzer is very costly... it

[76] CS00534553.
[77] CS00522552.

would be nice to have a "proof of concept" that we can spoof VINs..."

37.14.5. Brian Hsu later writes "I have finished writing a program in CAPL that would trick the CDR into thinking that it is talking to my car," and attaches a file named "Bosch CDR.txt."[78]

37.15. On May 26, 2020, Jason Bayley describes the process of using CDR Replay to a potential collaborator: "You should understand that there is a manual quality check on report data presentation, and we replay the crash data through the OEM tools to review a Bosch CDR report or similar for every collision."[79]

38. In addition to the above and as discussed earlier, the documentary record also contains what appear to be automated alert email messages to Brian Hsu containing the text "Check data decoding scheme with CDR replay,"[80] or, "Check data accuracy with CDR replay,"[81] from the time period between January 6, 2020 until as late as May 11, 2022. These alert emails suggest that the "CDR Replay" tool was still in use from early 2020 through at least May of 2022.

39. Taken together, these emails further support a conclusion that Respondents continued to use and update the "CDR Replay" tool with newer versions of the Bosch CDR Software as they became available. These emails also support a conclusion that Respondents used the software without a connection to a vehicle via the "CDR Replay" tool, with version 19.0 and newer of the Bosch CDR Software, to which the May 30, 2019 EULA should be relevant.

C. Bosch CDR Software versions that were installed on the Laptop appear to be outside of the time period described by Respondent's software licenses.

[78] CS00483405; CS00483416.
[79] CS00530170.
[80] For example, CS00020037 email from May 11, 2022; CS00013984 email from April 5, 2022.
[81] For example, CS00019390 email from December 13, 2021; CS00021441 email from December 9, 2020; CS00015676 email from January 6, 2020.

40. As described above, given the release dates of Bosch CDR Software versions and Respondent's one-year license purchase dates, the versions of Bosch CDR Software available during those time periods were versions 16.2 – 17.0; 17.6 – 17.10; and 19.0 – 19.4 of the Bosch CDR Software. There is evidence on the Laptop that Respondents installed versions 19.5, 19.6, 21.0, 21.1, 21.2, 21.3, 21.4, and 21.5 on the Laptop, versions that would not have been available during the time periods referenced by Respondent's purchase orders made available to me.

41. As described in paragraphs 23 through 28 in the Audit Report, incorporated here by reference, evidence on the Laptop indicates that multiple versions of the Bosch CDR Software were installed and/or reinstalled at least 325 times.[82] There are logs of installation for at least the following eleven versions of Bosch's CDR Software:

Table 2 Versions of Bosch CDR Software that had been installed on the Laptop as of 8-14-2022

16.4	**19.4**	**19.4.2**	**19.5**	**19.6**	**21.0**
21.1	**21.2**	**21.3**	**21.4**	**21.5**	

42. The Laptop also contains evidence that the Bosch CDR Software was run via Windows program crash files, and application hang events. An application crash is when a program encounters an error and needs to close unexpectedly.[83] An application hang, as differentiated from a crash, is when a Windows application becomes unresponsive for a period of time, but does not crash, and eventually becomes responsive again.[84] These hangs and crashes are

[82] Install logs for Bosch CDR Software discovered in C:\Windows\appcompat\Programs\Install; dtSearch hits from 345 to 670 are each install logs for the Bosch CDR Software; approximately 4:24 PM in 8-16-2022 Capture Video.

[83] "A crash is when something experiences a fault and has no choice but to exit," as described at https://techcommunity.microsoft.com/t5/ask-the-performance-team/basic-debugging-of-an-application-crash/ba-p/372392.

[84] "The operating system defines an application hang as a UI thread that has not processed messages for at least 5 seconds. Obvious bugs cause some hangs, for example, a thread waiting for an event that is never signaled, and two threads each holding a lock and trying to acquire the others. You can fix those bugs without too much effort. However, many hangs are not so clear. Yes, the UI thread is not retrieving messages - but it is equally busy doing other 'important' work and will eventually come back to processing messages," available at https://learn.microsoft.com/en-us/windows/win32/win7appqual/preventing-hangs-in-windows-applications.

predominantly for version 17.9 and 19.4 of the Bosch CDR Software, with at least one crash of version 21.5.1.[85]

43. This crash of the Bosch CDR Software version 21.5.1 on July 19, 2022 (per the crash dump file C:\Users\Brian\AppData\Local\CrashDumps\CDR.EXE.9656) is noteworthy for two reasons: first, the application crash for the Bosch CDR Software is for a recent version, version 21.5.1, well outside the time periods which are referenced in Respondent's purchase orders; and second, the "licensed company" is "StreetDelivery," and not CSI. **This crash dump file was likely generated on the Laptop when Bosch Software version 21.5.1 was running on the Laptop using the StreetDelivery license file.** This is evidence that Respondent ran Bosch CDR Software on the Laptop using other customer's licenses and certificates.[86]

44. In particular, the Laptop contained Bosch CDR Software license certificates for several versions of the Bosch CDR Software licensed to third-party companies that were not Respondent, namely Street Delivery and Biologic Forensics. The Laptop contained activation certificate files, "CTF files," that appeared to be for "1 year" terms, located in the directories C:\Users\Brian\Documents\CDR Installation\ and C:\Users\Brian\Documents\CDR Installation\Supplier, and listed in the table below.[87]

[85] As seen from approximately 3:08 pm to 3:42 pm in 8-16-2022 Capture Video.
[86] Visible at approximately 12:54 pm in 8-25-2022 Capture Video, the CDR.EXE Application crash was from July 19, 2022.
[87] Seen at approximately 1:16 pm in 8-25-2022 Capture Video; Supplier certs reviewed at approximately 3:47 pm in 8-25-2022 Capture Video.

Table 3: CTF Certificate Files on Laptop for companies other than CSI in the "Supplier" folder

Bosch CDR Software Version	Company listed within the CTF file
21.5	Street Delivery
21.5	BioLogic Forensics
21.4	StreetDelivery
21.3	StreetDelivery
21.2	StreetDelivery
21.2	BioLogic Forensics
21.1	BioLogic Forensics
21.0	BioLogic Forensics
19.6	BioLogic Forensics
19.4	BioLogic Forensics

45. There is also evidence in the documentary record related to Respondent requesting license and certificate files from StreetDelivery for at least Bosch CDR Software versions 21.2, 21.3, 21.5 and 23:

45.1. In October 2021 and December 2021, Jason Bayley asks Eric Castiglioni, vice president at StreetDelivery, to forward him the .ctf files for Bosch CDR software v21.2 and v21.3, respectively.[88] Jason Bayley writes "Can you please forward the .ctf file for the most recent software version? … You can forward them to Brian if you see these emails, they are released every quarter or so."[89] Eric sends the files and writes "I will forward all Bosch communications from now on so that we are on the same page."[90]

45.2. On April 9, 2022, Eric Castiglioni forwards the activation email and CTF file for Bosch CDR software v21.5 to Jason Bayley and Brian Hsu, simply writing "Passing along."[91]

45.3. On November 16, 2022, Eric Castiglioni forwards a Bosch message regarding a software patch for the Bosch CDR software to Brian Hsu. On December 28, Brian Hsu

[88] 3PP_0000260.
[89] 3PP_0000260.
[90] 3PP_0000260.
[91] 3PP_0000269.

asks Eric Castiglioni to send him the license for Bosch CDR software v23.0, which Eric sends.[92]

46. These certificate files from third-parties as well as the application crash of the Bosch CDR Software running "licensed to" Street Delivery raise the question as to why CSI would be running Bosch CDR Software on this Laptop using a license(s) from a different company, and whether Respondents may have improperly caused StreetDelivery and/or Biologic Forensics to improperly share license and certificate files with Respondent. It is my understanding from counsel that sections 2.1; 2.1.1; 2.1.2; 2.3; 2.3.6; 2.3.7; and 2.3.8 of the May 30, 2019 EULA are relevant regarding authorized and prohibited usage of the Bosch CDR Software, with special focus on prohibitions related to transfer, competitive, or unauthorized usage.[93]

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[92] 3PP_0000256.

[93] May 30, 2019 EULA:

2.1. Your Authorized Use of the Software. Subject to your compliance with this EULA in all material respects:

2.1.1. If You are an individual person and you received an activation certificate ("Activation Certificate") pursuant to a Bosch CDR Tool software Subscription from Bosch or an approved CDR Tool reseller or distributor ("Subscription"), Bosch grants You a personal, limited, non-exclusive, non-transferable, non-sublicensable, revocable license to use the Software, in object code form only, for the Purpose on the Designated Equipment. "Designated Equipment" shall mean no more than one personal computer per installation of the Software, such computer equipment to be identified by You as the equipment upon which You will be the primary user and intend the Software to be used.

2.1.2. If You are a company or any other type of organization, Bosch grants to You the right to designate one individual person within Your organization to have the non-exclusive right to exercise the rights set forth in Section 2.1.1.

2.3. Restrictions on Your Use of the Software. The Software or its components may be used only as expressly authorized in this EULA, and in no other way. You expressly agree NOT to:

2.3.6. Provide a copy of the Software to anyone who is not bound by this EULA, or permit, allow, or authorize any other person or entity who is not bound by this EULA to use the Software;

2.3.7. Use or permit any other person to use the Software in any way that competes with Bosch's products or services, except as expressly permitted by applicable law;

2.3.8. Attempt to transfer Your rights under this EULA, or delegate Your obligations under this EULA, without Bosch's express prior written permission.

D. Respondent's CrashScan App provides similar crash scan and reporting functionality as the Bosch CDR Software, and leverages Respondent's "CDR Replay" tool incorporating the Bosch CDR Software to continually verify, correct, improve and refine its output.

47. Respondent used a bus-sniffing tool named "BUSMASTER" (coincidentally also created by a Bosch-affiliated entity) to intercept and view the messages sent to and from the Bosch CDR Software. This information was used to extract and examine data transmitted to and from the Bosch CDR Software. This extracted data, along with the "CDR Replay" tool and Bosch CDR Reports generated by using the "CDR Replay" tool, were used to continually verify, correct, improve and refine the output of Respondent's own CrashScan software. Respondent's CrashScan software and reports provide similar features and functions to the Bosch CDR software and its associated reports, and Respondents describe their own solution as a "direct replacement for the Bosch tool."[94] Based on common English language definitions, this effort could qualify as reverse engineering. Potential reverse engineering is relevant, as the May 30, 2019 EULA for the Bosch CDR Software describes a restriction to attempted reverse engineering. Jason Bayley himself also believed that he and his team at CSI had reverse engineered their CrashScan diagnostic tool based on the Bosch CDR Software.[95]

48. I incorporate here by reference paragraphs 57 through 63 of the Audit Report. The bulk of the reverse engineering effort described appeared to be in intercepting, interpreting, and decoding the messages sent to and from the Bosch CDR Software and data used within the

[94] CS00521635 generally; "Strategic Business Proposal", attached to a December 7, 2018 email from Jason Bayley to Tom Walsh (CS00521578). Specifically, CS00521638.

[95] CS00521578, a December 12, 2018 email from Jason Bayley to Tom Walsh (Wawanesa) describes the process of creating the CrashScan as, "the reverse engineering manner in which we developed our diagnostic solution."; CS00517300, an October 12, 2017 email thread where Jason Bayley states, "Its looking more and more promising. And great investigative work with the pins and resistor! I will send some info I've gathered on the Toyota seed key algorithm, which may help... but also may need to be reverse engineering further also. Keep the updates coming!"

Bosch CDR Software reports in order to build and continuously improve Respondent's own CrashScan product.

49. This process is further borne out in numerous emails, where Jason Bayley and Brian Hsu are checking the results from the "CDR Replay" tool to compare and improve the CrashScan product. Some examples are in paragraph 37 above in this report.

50. Particularly relevant to reverse engineering was this correspondence:

> 50.1. On August 24, 2017, Jason Bayley writes to a person named Vladimir stating "I was working with an engineer who took traces of the Bosche [sic] system, by reverse engineering the process with a CAN bus sniffer, etc. We developed a mobile app and api to retreive [sic] event data on the vehicle side; we then ran the collected PIDs through the Bosche [sic] software/hardware, making it think it was plugged into a car. However, I am interested in making custom pdfs now. I recall you had experience turning hex data into pdfs, so I am wondering if you'd be interested in a project like this? I have a custom software for several manufacturers, and sample hex data shown on Bosche's [sic] cdr reports for many module types. There is a large amount of reverse engineering still to do as well."[96]

51. Additionally, the Work Logs of Brian Chang-Yun Hsu detail how the Bosch CDR Software as part of Respondent's "CDR Replay" tool, as well as Bosch CDR Software reports were used to improve Respondent's own CrashScan product over time.[97] As Mr. Hsu testified that his time entries were accurate descriptions of the work he was doing at the time,[98] the following appear to be true:

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[96] CS00534553.
[97] Document starting CS00018013.
[98] Hsu Transcript, page 144:12-146:3.

51.1. On April 16, 2018, Mr. Hsu used the "CDR replay for Toyota Cable 617" to improve and correct the source code for the vehicle.py Python source code for Respondent's CrashScan application, writing "Made a replay file for Cable 617 so that I could test the app and debug," then "Found an error in the calculation…fixed the error in vehicle.py."[99] Vehicle.py is part of Respondent's CrashScan application.[100] Mr. Hsu was using the "CDR Replay" tool (which incorporated the Bosch CDR Software) to test, debug, find, and fix errors in Respondent's own CrashScan software.

51.2. On April 17, 2018, Mr. Hsu "Replayed the data from Chad's truck to make sure the received data was complete for the CDR,"[101] Mr. Hsu used the "CDR Replay" tool to ensure data completeness in the CrashScan software.

51.3. On April 25, 2018, Mr. Hsu writes "Tried to replay the 2011 Toyota Corolla, which uses K-Line, but the ReplayFileMaker got an error. After some analysis I found the error and corrected it. The replay file then was made and replayed successfully. I then noticed that the resolution was a little bit off. I recalculated the resolution and updated vehicle.py."[102] Mr. Hsu used the "CDR Replay" tool incorporating Bosch CDR Software to recalculate and improve vehicle.py, part of Respondent's CrashScan software. Similarly, he also writes "Replayed a 2015 Ford Focus, but the CDR asked for an additional PID at the very end (22 F1 25). I added that PID to our request list. Since there could be more PIDs after the F1 25, we need to find similar cars and take a trace to get all PIDs."[103] Mr. Hsu used the "CDR Replay" tool incorporating Bosch CDR

[99] CS00018014.
[100] *See* paragraph 58.1 of the Audit Report.
[101] CS00018016.
[102] CS00018019.
[103] CS00018019.

Software to identify data that may be missing from Respondent's CrashScan software, and to take steps to improve the CrashScan software based on that finding.

51.4. On April 27, 2018, Mr. Hsu writes "2014 Toyota Matrix had a side impact, but the app did not report anything. This is due to pending response not completely removed from the raw data (fixed yesterday). Replayed this car's data and confirmed that the app would report the correct side impact delta-v."[104] This is another instance of using the "CDR Replay" tool to improve the CrashScan app. Similarly, "Implemented newly discovered FCA CAN ID in vehicle.py. The upgraded FCA process now checks three sets of CAN IDs, and then based on the responses it determines which set of PIDs to use. If all three CAN IDs cannot get any response from a car, the process ends."[105] Vehicle.py is part of the CrashScan app, implementing new features discovered due to the "CDR Replay" tool. Also, "Checked the 2015 Ford Focus trace. It looks like the CDR only asks F1 25 at the end of the process and no other PIDs, so the current PID list is okay."[106] This is another instance of using the trace and "CDR Replay" tool to improve and validate the data, specifically the PID list, in the CrashScan application.

51.5. On April 29, 2018, Mr. Hsu writes "Got a 2003 Buick Rendezvous from AmFam. This is a cable 829 module that I had not decoded due to lack of data (we only had one report before this). CDR replay worked and it was a pre-crash data only scan. Decoded available information and added in Python."[107] Also, "Went back and located the byte that controls whether pre-crash brake values were valid or not for GM VPW

[104] CS00018020.
[105] CS00018020.
[106] CS00018020.
[107] CS00507293.

cable 829 subtype 4. Updated the Python code to check that byte." [108] The "CDR Replay" tool was used to allow decoding of information, and improving the Python code of Respondent's CrashScan application.

51.6. On March 16, 2020, Mr. Hsu writes "GCNA scanned a 2020 Lexus ES 300h. The part number is not on the CDR's list, but the CDR was able to process it and generated a report (no crash data). Added the part number in the database." The Bosch CDR Software was used to improve the database for Respondent's CrashScan software.

51.7. On March 22, 2020, Mr. Hsu writes "Replayed a 2001 GMC Yukon XL by AmFam Ethos. The scan contained no crash data, but the generated report still said manual review required. Checked the database and confirmed that the model `Yukon' was in the database, but not `Yukon XL'. Added `Yukon XL' for model years 2001 to 2005."[109] The "CDR Replay" tool was used to improve and update the database for Respondent's CrashScan product.

51.8. On March 23, 2020, Mr. Hsu writes "Checked a 2018 Toyota Hilux scanned by MiWay South Africa. The delta-V and pre-crash data were all accurate. However, a couple of items in the seat belt and airbag table were different from the CDR. Checked the raw data and the bytes would correspond to what our interpretation was, but the CDR regarded them as 'SNA'. Could not figure out how the CDR determined that."[110] The "CDR Replay" tool was used to investigate an issue and attempt to determine how the Bosch CDR Software determined the "SNA" code.

51.9. On March 24, 2020, Mr. Hsu writes "Replayed and reviewed 2 AmFam GM

[108] CS00507293.
[109] CS00510285.
[110] CS00510286.

VPW reports. Both contained no crash data as confirmed by the CDR."[111] The "CDR Replay" tool was used to validate and confirm reports generated by the CrashScan software.

51.10. On March 25, 2020, Mr. Hsu writes "Replayed and reviewed a 2014 Toyota Corolla Quest scanned by KPNA as it triggered an internal alert of large variation in pre-crash speed. CDR confirmed the data accuracy."[112] The "CDR Replay" tool was used to confirm and validate the accuracy of Respondent's software.

51.11. On March 26, 2020, Mr. Hsu writes "Checked the 2001 Lincoln LS scanned by HUB. The delta-V value was off by a little bit. Checked the source code and confirmed the processing code was correct. The difference comes from the conversion factor used by Bosch. The module records longitudinal acceleration in g, and the CDR converts it to delta-V in mph. However, instead of using the more accurate conversion factor of 1.60934, it just used 1.6, so the results are slightly different."[113] The "CDR Replay" tool was used to verify, validate, and confirm conversion values used by Respondent's CrashScan software.

51.12. On March 27, 2020, Mr. Hsu writes "Replayed the 2013 Volvo S80 scanned by AmFam but CDR crashed again like it did for another Volvo in January. Tried the CDR900 and got the same error. Went over the ISO for AllState with Shekar. Compared the trace from another Volvo with the 2013 S80 from today. Moved some responses to a different location within the replay file and the CDR worked. This might be a Busmaster file reading issue."[114] The "CDR Replay" tool was used to improve and troubleshoot the

[111] CS00510287.
[112] CS00510287.
[113] CS00510288.
[114] CS00510289.

"CDR Replay" tool itself.

51.13. On March 31, 2020, Mr. Hsu writes "Checked and replayed a 2018 Volkswagen Tiguan. This vehicle had all 6 event slots filled, but 4 of which had only pre-crash data, with all 0 delta-V values. Modified the logic to display an event as 'Pre-Crash Data Only' if all delta-V values are 0."[115] The "CDR Replay" tool is used to diagnose and improve the programming logic for the CrashScan software.

51.14. On April 3, 2020, Mr. Hsu writes "Replayed and checked a 2006 Saturn Ion. The report looked good, but the longitudinal delta-V was off by 0.02 mph. Fed fake values back to the CDR to get a more accurate resolution. Updated the resolution in Python."[116] The "CDR Replay" tool was used to improve the Python code for Respondent's CrashScan software.

51.15. On May 2, 2020, Mr. Hsu writes "Went back to Honda K-Line decoding and located bytes that were relevant for controlling precrash data display by systematically making data bytes 0x00. Found the bits that control pre-crash steering, ABS, and ESC. Added checks for support for steering, ABS, and ESC in the Honda K-Line processing code in Python."[117] Here Mr. Hsu appears to be using the "CDR Replay" tool to systematically discover and decode the data and location for "steering, ABS, and ESC," and then updating the Python code in CrashScan to reflect the decoded data.

51.16. On May 5, 2020, Mr. Hsu writes "Got a 2005 Chevrolet Impala from AmFam. VPW replay did not work as CDR rejected the response to PID 0x2D. Checked the raw data and the module gave a positive response with all 0s. Typically, for this PID, the

[115] CS00510290.
[116] CS00514210.
[117] CS00510312.

number of bytes in the response would be 2 bytes, but this module gave out 6 bytes of 0x00s. Modified the raw JSON data so that each response contains the correct number of bytes, and CDR generated a 'no data' report. Modified the GM processing code to check for pre-crash data if delta-V is 0."[118] The "CDR Replay" tool was used to troubleshoot, verify, and ultimately improve the code in the CrashScan tool for processing GM vehicles.

51.17. On May 6, 2020, Mr. Hsu writes "Got a 2016 Audi A5 scan from Recon Engineering. CDR showed one event but all data values were invalid. The engineer had the CDR and his report said the same thing. Checked the raw data bytes and saw they were all 0xFEs. Made 0xFE in addition to 0xFF to be invalid in the processing code. The code will produce a 'no crash data' report."[119] The "CDR Replay" tool and Bosch CDR Software reports were used to improve the code and reports of Respondent's CrashScan software.

51.18. On May 8, 2020, Mr. Hsu's invoices reflect starting work on CDR Version 19.4 and Subaru decoding, writing "Downloaded and installed CDR version 19.4. Used a 2017 Subaru Crosstrek VIN with data from the Stark 2017 Subaru Outback. The CDR ran the same process, which is kind of expected as the first thing it asked for was the module ID. Based on the module ID, it determines which process to run…"[120] Mr. Hsu also writes "Added new vehicles, supported regions, and cable numbers for the new entries in CDR version 19.4 Got the first scan done by Theuns so now we have a module ID to use with the CDR. When that module ID, the CDR started sending out different

[118] CS00510313.
[119] CS00510314.
[120] CS00510315.

PIDs, although the security access algorithm appears to be the same. Created a special version of the Subaru process that only gets triggered for Theuns' VIN. This version would ask for supported PIDs under 0x10, 0x20, 0x21, 0x22, and 0x24. Got the second scan back from Theuns. However, during replay, CDR wanted a PID that the app did not ask, meaning it was likely that the PID was unsupported. Made a all PIDs version JSON file for this special Subaru process, where it would ask the car 22 {SID} XX, with XX going from 00 to FF. The total requests would be around 1280."[121] Here Mr. Hsu appears to be using the "CDR Replay" tool and the version 19.4 of the Bosch CDR Software to attempt to discover, determine values for, and ultimately support Subaru vehicles in Respondent's CrashScan software. The code for the CrashScan software was updated and improved based on this testing.

51.19. On May 10, 2020, Mr. Hsu writes "Checked CDR version 19.4 for new Toyota part numbers. Wrote the 21 new part numbers into the database table."[122] The new Toyota part numbers were extracted from the Bosch CDR Software, and used to improve the database for Respondent's CrashScan software.

51.20. On May 12, 2020, Mr. Hsu writes "Got a 2012 Dodge Grand Caravan scan that had some weird decoding issue. Did a CDR replay and the report came out clean. Checked the Python source code and corrected an error in the delta-V calculation code. With the correction, the code recognized the delta-V array was all 0xFFs and thus the module was actually empty. Released the report."[123] The "CDR Replay" tool was used to find and correct errors in Respondent's CrashScan software. Also on May 12, Mr.

[121] CS00510316.
[122] CS00510316.
[123] CS00510318.

Hsu writes "Replayed and checked a 2014 Toyota Prius scan. The EDR portion was okay, but there were two DTCs with unknown definition. Looked up on Google and added the definition to the lookup text file."[124] The "CDR Replay" tool was used to find and correct errors in Respondent's CrashScan software.

51.21. On May 15, 2020, Mr. Hsu writes "Got a 2015 Subaru Outback scan with crash data. This is the newer cable that I had already decoded and not the batch recently added in version 19.4. Checked the report and corrected an error in the processing code."[125] At minimum the Bosch CDR Report was used to validate and correct errors in the code for Respondent's CrashScan software. Also on May 15, 2020, Mr. Hsu writes "Checked a 2018 Ford Focus scanned by Theuns. The delta-V was 63 km/h and was confirmed by the CDR after using a North American VIN. ABS was engaged but pre-crash ABS had not been decoded yet. Added pre-crash ABS to the code."[126] The "CDR Replay" tool was used to validate data and improve the code for Respondent's CrashScan software.

52. The review above was only of a handful (five) of invoices covering about 10 weeks of work by Mr. Hsu. It is clear from these invoices that the "CDR Replay" tool and the Bosch CDR Software Reports were used often and repeatedly to improve Respondent's own CrashScan Software, and the efforts as described in emails and invoices could qualify as reverse engineering.

53. Mr. Hsu further testified that he has continued to use CDR Replay to verify reports produced by Respondent's software in 2023, and has utilized the same process of using CDR Replay even for 2023 model year vehicles.[127]

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[124] CS00510318.
[125] CS00510321.
[126] CS00510321.
[127] Hsu Transcript, pages 190:4 - 192:11.

IX. CONCLUSION

54. Based on my review and analysis, as well as my education training and experience, I have reached with a reasonable degree of professional certainly the following conclusions, as further described in the above report:

54.1. Respondent's "CDR Replay" tool is based on and incorporates Bosch's CDR Software;

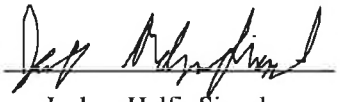
54.2. Respondent's "CDR Replay" tool runs the Bosch CDR software without a connection to a real car;

54.3. Bosch CDR Software versions that were installed on the Laptop appear to be outside of the time periods described by Respondent's software licenses; and

54.4. Respondent's CrashScan App provides similar crash scan and reporting functionality as the Bosch CDR Software, and leverages Respondent's "CDR Replay" tool incorporating the Bosch CDR Software to continually verify, correct, improve and refine its output.

Respectfully submitted,

Date: November 6, 2023



Joshua HelfinSiegel

Attachment 1

Mr. HelfinSiegel has more than sixteen years of experience as an IT professional, including Systems Administration, Security, and Technical Support experience. Since 2011, he has worked as a litigation consultant for DisputeSoft. He is responsible for all of the environments, data, and systems in use at DisputeSoft, including data security and Domain management. He has extensive experience in dealing with the complex issues surrounding large software implementation failures, copyright infringement and trade secret misappropriation, and digital forensics. He has worked on a variety of software failure, patent, copyright, and digital forensics cases and has performed numerous analyses of: Software Requirements, Design, Development, Testing, Defects, Software Quality, and Project Schedules. He has performed the AFC test, as well as analyzed various code sets for evidence of copying to support infringement or misappropriation claims. He has analyzed digital forensic evidence, including searches for evidence inappropriate copying of confidential information, and evidence of deletion of said information. He specializes in failed software implementations; intellectual property; databases and data analytics; computer networking, hardware, and infrastructure; and digital forensics. Mr. HelfinSiegel is an EnCase certified forensic examiner.

Prior to starting at DisputeSoft, Mr. HelfinSiegel worked as the IT Manager for a property management company, TM Associates Management. There he served as the sole Systems Administrator, IT Director, and IT Support point of contact for a company of over 150 distributed locations and over 100 remote and 20 centralized employees. He was responsible for all of the environments, data, and systems in use at the company, including data security and Domain management. Responsibilities also included the installation and maintenance of several antivirus and malware protection software, malware and virus removal for over 100 remote sites, protection of an in-house network against internet threats and vulnerabilities, and hardening servers against potential points of attack.

DISPUTESOFT EXPERIENCE

Copyright Infringement and Trade Secret Misappropriation Disputes

TruLogic v. GE Aviation (2023)
In this intellectual property case involving alleged breach of End User License Agreement ("EULA") related to creation of derivative works in the aviation industry, assisted counsel with analyzing source code and drafted an expert report and supplement to respond to opposing expert opinions related to Interactive Electronic Technical Manuals ("IETMs"), and to address quality and quantity of alleged copying. Anticipate providing deposition testimony and testifying at trial. Ongoing engagement.

Benchmark Technologies, Inc. v. Yuqiang Tu et al (2022)
In this alleged trade secret misappropriation case in the optical lithography industry, analyzed sets of source code for evidence of copying and misappropriation of trade secrets surrounding highly technical aspects of the lithography as embodied by source code. Ongoing engagement.

Trent P. Fisher Enters. v. SAS Automation, LLC (2022)
In this alleged copyright infringement and trade secret misappropriation case in the manufacturing and robotics industry, assisted counsel with responding to Plaintiff's expert report opinions, as well as in understanding the viral nature of the open-source GNU General Public License, Version 3 as applied to works at issue in this matter. Ongoing engagement.

[party names withheld] (2022 AAA Arbitration)
In this alleged infringement and breach of contract matter, assisted counsel in a computer and source code forensic audit, reviewing keywords search results and source code for indicia of reverse engineering and/or improper use of Plaintiff software. Filed Declaration to support counsel's motion to compel. Ongoing engagement.

Covetrus, Inc. and Veterinary Data Services, Inc. v. Actian Corporation (2022)
In this alleged copyright infringement and license violation matter in the veterinary industry, reviewed and responded to opinions in Plaintiff's expert report regarding copyrights; performed forensic computer analysis and cloud virtual system audits to search for indicia of the presence of installed software to compare against the allowed number of installs per software license. Provided expert report and deposition testimony. Ongoing engagement.

[party names withheld] (2021)
In this copyright infringement, trade secret, and patent infringement case in the banking industry, analyzed deposited copyright material as related to alleged trade secrets for evidence of disclosure of trade secrets in the registered work, as well as analysis related to whether the version of code contained in the copyright material appeared to be a true and accurate copy of what was represented as the registered work. Additionally, decompiled and disassembled android and iOS code for comparison against alleged trade secrets. Ongoing engagement.

Ubiquiti Networks v. Cambium Networks, et al. (2020)
In this copyright infringement and breach of contract case, engaged due to familiarity and expertise regarding source code analysis and the GPL license. Analyzed different registered versions of software programs for presence of open-source code protected by the GPL license to support counsel arguments regarding copyright infringement, breach of contract, and to determine which source code elements would be protectable but not affected by the copyleft nature of the GPL license. Conducted on-site source code review of opposing party's code to search for evidence of copying of the registered works.

Bethesda Softworks, LLC v. Behaviour Interactive, Inc. et al (2018)
In a copyright infringement and breach of contract case involving allegations that a software vendor had misappropriated plaintiff's source code in the development of a mobile video game built in C# and using the Unity engine, assisted counsel with restoring perforce source code repositories, extracting relevant source code and design documents, analyzing the source code and design documents for evidence of copying, and filtering of third-party and non-protectable portions of the code.

[party names withheld] (2017)
In this intellectual property case involving alleged theft of trade secrets related to databases and source code in the medical healthcare data industry, assisted counsel with drafting production requests, interrogatories, and directing production requests toward acquiring the materials needed for expert analysis with regard to trade secret misappropriation allegations in this case. Assisted counsel by drafting Declarations and Expert report regarding data flows within a legacy system to explain to the court how trade secret misappropriation would have occurred based on how the system was configured. Anticipating database analysis, audit log analysis, source code repository analysis, among other analyses after production has been made available. Ongoing engagement.

Arkeyo v. Cummins (2017)
In this intellectual property case, assisted counsel with analysis of source code, dlls, and compiled code to determine if trade secrets had been unintentionally disclosed. Provided a declaration to counsel detailing the importance of the Defendant producing its source code repository so that code and development could be reviewed and analyzed for evidence of copying from the Arkeyo software.

Atlantic Technology Enterprises, Inc. v. Lincoln Park Savings Bank & Abacus I.T. Inc. (2017)
In this intellectual property case, reviewed the document production and depositions to determine what material the Plaintiff claimed was its proprietary information. Reviewed Windows Server backups for proprietary information in order to determine if misappropriation occurred.

Cobra Systems, Inc. v. Unger et al. (2017)
In this intellectual property case, performed source code comparison and reviewed evidence related to both copyright infringement and trade secret misappropriation claims involving software used to print various labels, such as barcodes. Performed an Abstraction-Filtration-Comparison test between two sets of source code in order to demonstrate that the structure, sequence, and organization of the two software programs was substantially similar. Provided a declaration to counsel detailing the evidence of copying between two sets of source code. The declaration also covered the topic of proper clean room design when creating a new product, in order to avoid misappropriation of trade secrets or other protected intellectual property.

ECIMOS, LLC v. Carrier Corporation (2016)
In this intellectual property case, performed source code comparison and reviewed evidence related to both copyright infringement and trade secret misappropriation claims involving software and hardware used for quality testing air conditioning units, as well as what constituted a software API. Traveled to Collierville, TN to view software and hardware in action at the manufacturing plant. Provided a written Declaration to court regarding the difficulty of copying from the text-based source language to the graphics-based language of the accused product. Provided testimony in person to the same effect on September 1, 2017 at a Preliminary Injunction Hearing. Provided a written Declaration signed October 13, 2017 in support of Carrier's memorandum in opposition to Plaintiff's motion to reopen proof, detailing material issues with the opposing expert's report. Provided a written Expert report signed on October 30, 2017 containing affirmative opinions related to clean room design, database comparison and source code analysis, as well as detailing material issues with the opposing expert's report. Provided deposition testimony on January 11, 2018 related to all previously provided written testimony. Provided a Supplemental Expert Report, signed on April 30, 2018 containing affirmative opinions as well as rebutting the newest assertions from opposing expert, and detailing how to apply the Abstraction Filtration Comparison test with regard to the databases at issue in this case. Lastly, provided testimony on June 29, 2018 at jury trial reiterating points made in the Declarations as well as Expert reports and exhibits. Specifically provided testimony focused on database and software issues regarding copyrights and trade secrets, and the Abstraction Filtration Comparison test.

T&S Property Management v. Cinc (2016)
In this intellectual property case, performed source code comparisons between two sets of c-sharp source code and databases to determine if any literal copying had occurred between the programs. Reviewed the code to determine whether one software program was likely derived or reverse-engineered from a competing software program, as reverse-engineering was explicitly prohibited by software license.

QueTel: Consulting (2016)
Analyzed different versions of software programs for evidence of the presence of open-source code protected by the LGPL V 3.0 pursuant to a copyright registration and potential trade secret litigation.

Michael Mohr v. Science and Engineering Services, Inc., et al. (2014)
In this intellectual property case, performed extensive source code comparisons, as well as documentary review, towards determining whether literal copying of source code had occurred outside the scope of a licensing agreement. Interviewed several fact witnesses, drafted interrogatories and deposition questions, performed in-depth analysis related to low-level printer commands and the creation of labels for aircraft. Drafted expert report.

Prosuite Software Limited, et al. v. InfoKey Inc., et al. (2013)
In this intellectual property case performed a class-usage and function-call analysis to determine if any code from one source code set was called in new source code.

Planet Bingo, LLC and Melange Computer Services, Inc. v. VKGS, LLC, d/b/a Video King (2012)
In this software misappropriation case involving casino point-of-sale (POS) gaming software, restored server and client systems, and then performed comparison of plaintiff and defendant software, functionality and documentation to assist in determining whether defendant's software and functionality was substantially similar to and designed using plaintiffs' confidential information.

American Petroleum Institute (2011)
In this copyright infringement case against unknown individuals operating out of China, conducted an investigation to determine the identities of these individuals and determine the extent to which the plaintiff's materials had been pirated. Evaluated websites for potentially infringing content based on PDF standards and sale of copyrighted materials.

Certification Trendz, LTD. v. PassGuide.com et al. (2011)
In this copyright infringement and trademark misappropriation case against unknown individuals operating out of China, conducted an investigation to provide attribution of these individuals and determine the extent to which the plaintiff's materials had been pirated. Used domain tools and other IP address related utilities to find the names and IP addresses of likely culprits of the infringement.

InDyne, Inc. v. Abacus Technology Corporation, et al. (2011)
Performed web server log analysis and environment reconstruction on behalf of the defendant in this trade secret misappropriation case between NASA contractors. Performed forensic keyword search analyses and rebutted opposing expert's claims over infringing content. DisputeSoft demonstrated that the deposited material from the copyright registration of the misappropriated was actually a reconstruction of the original work through an analysis of the source code and the deposit materials on file with the U.S. Copyright Office.

Nexus v. Kroughly, Limesoft et al. (2011)
In this intellectual property case in the emissions monitoring industry, provided an Affidavit and testimony regarding the nature of compressed "tar.gz" files, restoring backups of source code repositories, and xml configuration settings in source code. Testimony provided at trial highlighted the steps and resources available to the Defendants to determine how to restore a backup of a source code repository to a new location. Testimony also discussed how xml configuration files could be used to validate or verify the origin of accompanying source code produced in the case. Forensic analysis work is ongoing as of 2018.

The Studer Group, LLC. v. The Cleveland Clinic Foundation (2011)
In this intellectual property case, worked closely with the client to acquire and differentiate source code repositories of interest for comparison of infringing code. Forensically acquired and compared source code from repositories and rebuilt the source code management system along with the repositories in question. Compared user login and commit date histories between code repositories to show a lack of cross-contamination between projects. Assisted counsel with deposition questions related to the projects and contract in the case.

IT Project Failures

DXC v. Optus (Consulting) (2021)
In this software failure case involving telco service provider software in the telecommunications industry, assisted counsel in understanding the strengths and weakness of their case based on defect ticket reports and other documentary evidence.

Blue Cross Blue Shield of California v. Health Plan Services (2021)
In this ongoing software failure case involving software in the healthcare and medical insurance industry, assisted in reviewing and responding to opposing expert analyses and findings related to industry standards and the ordinary standard of care. Additionally, assisted in providing examples of expert analyses that would ordinarily have been undertaken by opposing experts, but were not.

Cerner v. Fujitsu (2020)
In this alleged software failure case involving health care software, assisted in developing protocols and analyses for expert agreement to be employed during litigation related to defects and software quality.

Bibb County School District v. Dallemand, et al. (2018)
In this software failure case in the education industry, aided both parties as an independent technical expert with a narrow focus on identifying issues surrounding a production dispute. Engaged at the request of the judge in the matter to provide insight and help resolve the technical problems surrounding the software production.

Pennsylvania Department of Labor and Industry v. IBM (2017)
In this ongoing software failure case regarding a large-scale software modernization project, helped direct data preservation efforts, restoration and analysis of key systems, drafted target opinions and Expert report. Managed a large and complex data analysis effort, as well as all internal personnel throughout the process. Directed a robust and wide-ranging source code analysis strategy, ensuring each analysis employed had basis in applicable industry best practices and/or basis in usage during the engagement. Analyses included static code analyses of code quality for complexity, reliability, flexibility and maintainability compared against industry best practices. Analyses also included defect data analyses related to defect potentials, defect removal efficiency, and defect density against industry best practices. Analysis of test data included analysis of unit test script quality, and rate of test execution compared against rate of test exits to estimate a reasonable project completion date. Additionally, analyzed requirements, design, project management and project schedule delay, as well as verified and validated 3rd party reports and assessments during the project. Drafted expert report; reviewed and responded to multiple expert rebuttal reports in drafted surrebuttal report. Settled 2021.

Acumen v. ADS (2016)
In this software failure case regarding the modernization of a Configure-Price-Quote (CPQ) system, analyzed performance benchmarking data, statements of work, software and system requirements, emails and service contracts to determine if the system as delivered met or exceeded the performance requirements as represented by Acumen. Reviewed procedures followed by Acumen in regards to due diligence in vendor selection in the consulting process with ADS.

Federal Signal Technologies, LLC v. Texas Department of Transportation (2014)
In an administrative hearing regarding highway tolling system contract that was terminated for convenience, assisted in a percent-complete analysis of various deliverables specified in the contract. Linked the hardware architecture diagrams to purchased items based on invoices, emails, and the documentary record.

Mary Rutan Hospital v. NextGen Healthcare Information Systems, LLC (2014)
In this software failure case regarding a failed implementation of hospital management software, performed data analysis of defect data towards determining if contractual agreements for support had been met. Interviewed several fact witnesses, drafted interrogatories and deposition questions, reviewed production environment to perform validation testing. Restored ticketing systems for review and analysis. Drafted expert report.

AMC Technology, L.L.C. v. Cisco Systems, Inc. (2013)
In a breach of contract case involving software for connecting call center systems to third-party CRM software, reviewed documents, testimony, and source code to reach opinions regarding how effectively the defendants conveyed information to the plaintiff in a timely, accurate manner in adherence to standard industry practice. Analyzed a list of purported defects identified during performance testing to determine how many issues, if any, would have had a material impact on the defendant's ability to ship the software to customers. Drafted expert report.

Arc-Com Fabrics, Inc. v. Third Wave Business Systems, LLC (2013)
In a software project failure case involving the deployment of an SAP Business One system for use by a textiles manufacturer, assisted in drafting an expert report opining on issues of system instability, slow system performance, poor source code quality, and deviations from industry standard practices. Performed reconstruction of production system environments for validation testing.

CedarCrestone, Inc. v. Affiliated Computer Services, LLC, et al. (2013)
In a software project failure case involving a failed PeopleSoft upgrade, conducted data analyses of defects recorded in HPQC to determine if material defects in the PeopleSoft software developed by the plaintiff prohibited the project from reaching go-live on time. Performed analysis of defects found in later phases of testing that should not have passed initial Unit testing, had proper testing been performed.

American Orthodontics Corporation v. Epicor Software Corporation (2011)
In this software failure case performed reconstruction of the Epicor ordering system, database environment, and web portal. Assisted in developing a script to simulate large volume orders, then used the script to perform functional testing of said system to prove that orders were delayed and even lost by the software. Performed load-testing analysis to rebut claims that the problems were due to insufficient hardware.

Deluca Enterprises, Inc., et al. v. SAP America Inc., et al. (2011)
In a case alleging overselling and under delivering ERP software, conducted an analysis to determine degrees of similarity between two sets of ARIS business process models based on representations of an SAP integrator that allegedly had reference models applicable to 80 percent of their client's business processes. Rebuilt tape library system and catalog in order to review, analyze and restore relevant data from backup tapes.

Toronto Community Housing Corporation v. Information Systems and Services, Inc. (2011)
In this arbitration brought by a social housing authority against a software vendor before the American Arbitration Association, reconstructed the application environment and systems required for the extensive functional testing needed for this case. Developed and employed a functional testing matrix based on the project's contract and functional specifications, performed functional validation testing, and assisted in the preparation of expert report and hearing materials to establish that the defendant delivered software containing material defects and misrepresented its software's state of readiness during procurement.

GC Services Limited Partnership v. Ontario Systems, LLC, et al. (2010)
In this software project failure case, traveled to Houston, TX and performed forensic acquisition of data as well as extensive analysis and reconstruction of systems from the forensically acquired databases and images. Reconstructed the software environment from the ground up to perform functional testing of the claims in the original pleadings. Reviewed the underlying system architecture and assisted in the preparation of a report evidencing spoliation of the system by the plaintiff. Rebutted allegations of system instability and poor project management through extensive review of case documentation, deposition testimony, and project management standards.

Hudec Dental Associates, Inc. v. Multimedia Dental Systems, Inc. (2010)
Performed extensive analysis of system and audit logs between Dental Practice Management Systems at issue in a software failure case. DisputeSoft demonstrated that the software was materially defective, failed to conform to agreed-upon specifications, did not include promised functionality, contained significant security vulnerabilities that rendered it non-compliant with HIPAA privacy requirements, and was not incapable of supporting the business operations for which it was acquired. Rebutted allegations of ongoing system use past the date of contract termination through extensive audit log analysis and system testing.

Software Patent Infringement Disputes

Wapp Tech Limited Partnership Et Al v. Wells Fargo Bank, N.A. (Consulting) (2022)

In this alleged patent infringement case, assisted counsel by researching the Android device emulator from Android studio in understanding how it works by analyzing its underlying technologies, hardware, software, and networking emulation. Additionally, researched the potential origin of network latency and speed default values available in code as related to the pending patent litigation.

[Party names withheld] (Consulting) (2021)
In this potential patent infringement case in the medical device industry, reverse-engineered and analyzed reverse-engineered operating system for presence or absence of features from the patents at issue in the instant matter. Attempted to access and analyze hardware for presence of patented methods via TCP, UDP, and hardware debugging interfaces, such as JTAG, UART, and SWD.

Uniloc USA, Inc., et al. v. Activision Blizzard, Inc. (2013)
In this patent infringement case, installed, tested activation protocols, captured packet and web traffic for several different versions of antivirus and antimalware software. Assisted in the installation and testing on several different windows platforms in order to verify the process used for software activation.

Apple v. HTC Corporation (2010)
In this smartphone patent infringement litigation before the International Trade Commission, reviewed source code for mobile and desktop operating systems related to the patents at issue. Supported invalidity, non-infringement and lack of domestic industry contentions through research, code review and claim charts. Served as a consulting expert.

Computer Forensic Matters

ZL Technologies v. SplitByte (2023)
In this digital forensics, breach of contract, and intellectual property case in the software and data services industry, assisted with forensic analysis of computer systems and artifacts for evidence related to the claims in the pleadings.

Arconic Corp. and Howmet Aerospace Inc. v. Novelis Inc. and Novelis Corp. (2022)
In this trade secret misappropriation and breach of contract case in the aluminum industry, extracted and analyzed the metadata contained in court docket items to demonstrate that the "Author" metadata field does not establish the individual that created the contents of a given Microsoft Word document. Drafted and signed a Declaration to support counsel's successful opposition to a Motion to Recuse.

Deere & Company v. AGCO Corporation (Consulting) (2021)
In this digital forensics and alleged patent infringement case in the agriculture industry, examined numerous forensic images and artifacts to determine the most likely cause of a small number of allegedly confidential documents flowing from one company to the other.

[party names withheld] (2021)
In this digital forensics and trade secret case in the artificial intelligence and technology industry, assisted counsel in acquiring and processing a digital laptop image, scanning for deleted Windows and Linux files, and attempting recovery of deleted files related to alleged trade secret claims. Ongoing engagement.

HeliumCloud v. KWITU (2021)
In this digital forensics, copyright, and breach of contract case in the non-profit industry, assisted counsel in drafting discovery requests and determining which forensic evidence to acquire and preserve. Issued expert report and deposition testimony. Ongoing engagement.

[party names withheld] (2020)
In this digital forensics matter in the video games industry, developed and applied a forensic analysis methodology for investigating a user's usage activity with respect to specific games and the online store for an Xbox One video game console. Ongoing engagement.

Cumberland Forensic (2018)
Analyzed a hard drive for evidence of copying of protected company data to online file shares, and for usage of the Tor browser. Performed an on-site audit to ensure that protective measures put in place were sufficient to guard against future infractions by staff attempting to bypass company policy and security measures.

Edifice Forensic (2017)
Created a forensic image of a laptop. Searched for evidence of drive-wiping tools and recovery of deleted data.

Elalaily Forensic (2017)
Isolated emails sent or received within a certain date range in PST for production.

Thomas Forensic (2017)
Created a forensic image of a laptop and cell phone. Searched for evidence of drive-wiping tools and recovery of deleted email data. Isolated emails sent or received within a certain date range in PST for production.

Welsh Forensic (2017)
Created a forensic image of an android phone and provided text message and MMS analysis for the client in the form of a forensic report.

Emery Federal Credit Union: Forensic Imaging and Analysis (2016)
Imaged a RAID 10 email server and analyzed extracted Exchange server data. Restored data from a proprietary backup format for imaging and analysis; restored and imaged a virtual machine hard drive (VMDK) for inventory and analysis.

State v. [Minor – name withheld] (2016)
Analyzed evidence provided by the State of Maryland to determine if it could be concluded that emails were sent from Defendant to a school administrator. Filed an affidavit to support a motion *in limine* to prevent paper-printout evidence from being used to verify the sender of the email when better evidence was available and email is easily forged. Served as a testifying expert in court, but the case was dismissed in court just prior testimony due to State failing to meet its burden of proof.

State v. Kelvin Sewell (2016)
Created a forensic image from an iPhone 4 and provided text message and MMS analysis for the client in the form of a forensic report.

Elwood Staffing v. Sandler (2016)
Created a forensic image of a laptop computer and searched for evidence of file deletion, as well as searching for evidence that drive-wiping software had been run. Additionally, searched for evidence that company files and data were taken. Provided written forensics report of all findings to the client.

Patriot Metals v. K-fab (2016)
Analyzed windows event logs and IP addresses for evidence of unauthorized remote access to company systems and servers.

ATOS: Forensic Imaging (2016)
Contracted by ATOS to forensically acquire, image, and inventory twelve computers and one USB device. Provided completed acquisitions to ATOS.

Golden v. Gant (2015)
Reviewed three digital audio recording for metadata inconsistencies or other evidence of alteration or tampering.

In re: Vincent L. Abell (2014)
Forensically acquired and imaged a desktop computer hard drive pursuant to a litigation regarding bankruptcy.

Nabijohn v. ITS (NYS Department of Financial Services) (2014)
In this video forensics case performed frame-by-frame analysis of security system footage combined with motion data to conclude whether video files had been altered or footage could conceivably be missing. Drafted expert report.

Pacific Bioscience v. Nutra Luxe MD (2012)
Assisted as a neutral expert in forensic imagining, analysis, and e-discovery regarding emails from a MacBook. Forensically extracted emails from different sources and loaded into a Concordance database.

General Electric Company v. Mitsubishi Heavy Industries, LTD., et al. (2011)
Assisted in developing an electronic discovery application used to review terabytes of backup data and prepare secure reports for counsel without directly viewing confidential data. The application reduced electronic document review costs by orders of magnitude and countered opposing counsel's claims of undue burden to produce relevant documents. Created extensive test data sets designed to simulate the environment of an enterprise system unrolled from tape backups and perform load testing on the application.

General Electric Company, et al. v. Thomas Wilkins (2011)
In this patent infringement case traveled to Kansas City, MO for inspection and inventory of legacy tape collection. Rebuilt legacy tape drive library systems for data recovery and searches for certain keywords related to the patent and defendant.

Declarations, Affidavits, Reports, and Testimony

Arconic v. Novelis – United States District Court for the Western District of Pennsylvania; Case No. 2:17-cv-1434-JFC. Filed November 3, 2017.

Declaration: Declaration signed January 31, 2022 detailing how "Author" and "Created" date metadata work within Microsoft Word documents, what those metadata establish, and demonstrating the variety of "Authors" listed on court filings in the instant matter.

Arkeyo v. Cummins – United States District Court for the Eastern District of Pennsylvania; Case No. 2:16-cv-04720 (ABB). Filed August 29, 2016.

Declaration: Declaration signed April 4, 2017 detailing the importance of the production of the source code repository for expert review.

[party names withheld] (2022 AAA Arbitration).

Declaration: Declaration signed September 19, 2022 in support of counsel motion to compel additional production.

Benchmark Technologies, Inc. v. Yuqiang Tu et al – United States District Court District of Massachusetts; Case No. 1:22-CV-10227-LTS. Filed February 10, 2022.

Expert Report: Expert Report signed on October 7, 2022 containing affirmative opinions evidence of copying in source code.

Cobra Systems, Inc. v. Unger et al. – United States District Court Central District of California; Case No. 16CV00569-ODW-JEM. Filed March 28, 2016.

Declaration: Declaration signed March 20, 2017 detailing the Abstraction Filtration Comparison test performed as well as evidence of copying between software programs.

Covetrus, Inc. and Veterinary Data Services, Inc. v. Actian Corporation – United States District Court for the District of Maine; Case No. 2:21-cv-00097-LEW. Filed April 6, 2021.

Expert Report: Expert Report signed on June 24, 2022 containing affirmative opinions on comparisons of source code and copyright registrations, responses to Plaintiff's Expert opinions, as well as detailing audit findings.

Testimony: Provided deposition testimony on July 1, 2022 on topics covered in Expert report related to code comparisons, copyright registration, and the systems audit.

ECIMOS, LLC v. Carrier Corporation - United States District Court Western District of Tennessee, Western Division; Case No. 2:15-cv-2776-JPM-cgc. Filed November 6, 2015.

Declaration: Declaration signed December 22, 2016 in rebuttal to Plaintiff's claims, as well as detailing the challenges of comparing text-based source code to graphical source code.

Testimony: Testimony provided at a September 1, 2017 Preliminary Injunction Hearing reiterating points made in the Declaration, as well as touching on elements of proper clean room design and details of the source code review.

Declaration: Declaration signed October 13, 2017 in support of Carrier's memorandum in opposition to Plaintiff's motion to reopen proof, detailing material issues with the opposing expert's report.

Expert Report: Expert Report signed on October 30, 2017 containing affirmative opinions as well as detailing material issues with the opposing expert's report.

Testimony: Provided deposition testimony on January 11, 2018 on topics covered in Declarations and Expert report related to clean room design, database comparison and source code analysis.

Supplemental Expert Report: Expert Report signed on April 30, 2018 containing affirmative opinions as well as rebutting the newest assertions from opposing expert. Abstraction Filtration Comparison test included with regard to the databases at issue in this case.

Testimony: Testimony provided at June 29, 2018 jury trial reiterating points made in the Declarations as well as Expert reports and exhibits. Specific focus on database and software issues regarding copyrights and trade secrets, and the Abstraction Filtration Comparison test.

HeliumCloud v. KWITU – United States District Court for the District of Maryland; Case No. 8:2021cv01212. Filed May 17, 2021.

Expert Report: Expert Report signed March 14, 2022 detailing deficiencies in the production and preservation of evidence, as well as the analyses that would be performed on the evidence, had it been properly preserved and produced in the instant matter.

Testimony: Provided deposition testimony on October 20, 2022 on topics covered in Expert report related to deficiencies in the production and preservation of evidence.

Nexus v. Krougly, Limesoft et al. – Ontario Superior Court of Justice; Court File No. 3660/2011. Filed March 8, 2011.

Expert Report: Expert Report signed April, 6, 2022 detailing how source code repositories were connected to and used for software development on from two computers based on forensic evidence on the two computers.

Affidavit: Affidavit signed February 15, 2017 detailing how to extract and restore data from an SVN repository, as well as the importance of specific xml files in validating the origin of produced source code.

Testimony: Testimony provided at a hearing on July 13, 2017 covering the topics explained in the Affidavit, as well as touching briefly on clean room design.

Affidavit: Affidavit signed December 16, 2021 detailing the presence of forensic artifacts related to e-mail migration from Microsoft Outlook to Google Apps, as well as detailing forensic artifacts referencing to specific e-mail addresses of interest.

Trent P. Fisher Enters. v. SAS Automation, LLC – United States District Court Southern District of Ohio; Case No. 3:20-cv-216. Filed March 31, 2021.

Expert Report: Expert Report signed November 11, 2022 detailing how the GPL should apply to central issues in the matter, as well as responding to Plaintiff's expert report and opinions contained therein.

Testimony: Provided deposition testimony on January 31, 2023 on topics covered in Expert report related to responses to opposing expert's opinions, the GNU General Public License, version 3, and the software at issue in this case.

TruLogic, Inc. v. General Electric Company through its GE Aviation Division – Common Pleas Court of Greene County, Ohio General Division; Case No. 2020 CV 0464. Filed September 15, 2020.

Expert Report: Expert Report signed June 12, 2023 addressing quantity and quality of alleged copying, as well as responding to Plaintiff's expert report and opinions contained therein.

Supplemental Expert Report: Supplemental Expert Report signed July 20, 2023 addressing factual findings, screenshots, as well as addressing Plaintiff's expert second supplemental report.

Testimony: Provided deposition testimony on August 10, 2023 on topics covered in Expert report related to responses to opposing expert's opinions and the software at issue in this case.

State v. [Minor – name withheld] – Montgomery County, MD Circuit Court; Petition #06-J-16-050314. Filed October, 2016.

Affidavit: Affidavit signed November 14, 2016 detailing the steps one could take in order to authenticate that an email was sent from a specific device and received by the recipient, and that paper printouts, in lieu of any other qualifying information, were not sufficient to authenticate an email.

EDUCATION AND EMPLOYMENT HISTORY

Education

Bachelor of Arts, Computer Science
Certificate in Bioinformatics and Modeling
The Wesleyan University, Middletown, CT

Employment History

Testifying Expert, Manager and Forensic Examiner, DisputeSoft (Jan. 2011–Present)
Drafted Affidavits, Declarations, and Expert Reports to support counsel. Testified as an expert in areas related to software, copyright, and computer systems. Performed and is knowledgeable in the Abstraction Filtration Comparison test. Forensically acquired, rebuilt, and tested numerous system environments. Performed various analyses on data extracted from a variety of database types and systems. Drafted expert reports and aided in formulating expert witness opinions for cases. Performed root cause analyses related to system outages pursuant to SLAs and MSA requirements. Built and administered a domain from the ground up, including Active Directory, Group policy, VPN, telephony, wired and wireless networking, Disaster Recovery and backup strategy, antivirus and SharePoint solutions. Managed updates, backups and recovery for all server data and systems, as well as system security for an office of networked and computers. Managed all hardware capacity planning, implementation, maintenance and support, as well as supporting and maintaining software licenses and warranties. Certified as an EnCase Certified Examiner for computer forensics since October, 2012.

IT Manager and Systems Administrator, TM Associates Management, Inc (Oct. 2005-Jan. 2011)

Managed updates, backups, and recovery for all server data and systems. Maintained system security, Active Directory and domain services for an office network of computers as well as for over 150 remote locations, including protection against and removal of viruses and malware. Maintained critical system application servers in OS/400 as well as Windows environments. Provided system and application support to over 100 users for a custom-based property management software as well as Windows operating systems. Created and customized a number of Crystal Reports and administered the database for the proprietary software solution. Managed all hardware capacity planning, implementation, maintenance and support, as well as supporting and maintaining software licenses and warranties.

Certifications

EnCase Certified Examiner (since October 2012)

Programming Language and Database Familiarity

Java, C#, C, CPP, Objective-C/Swift, Python
MS-SQL, MySQL/MariaDB, Oracle, SQLite

Attachment 2

Materials relied upon include the items listed in the "Materials Considered" section of the Expert Report, footnoted citations, as well as the below, if not explicitly stated within the Expert Report.

3PP_0000256
3PP_0000260
3PP_0000269
BOSCH000082
BOSCH000105
BOSCH000923
BOSCH000924
BOSCH002655
BOSCH002795
BOSCH002827
CS00013052
CS00013984
CS00015676
CS00016315
CS00016681
CS00018013
CS00018014
CS00018016
CS00018019
CS00018020
CS00018832
CS00019390
CS00020037
CS00021283
CS00021441
CS00024812
CS00024814
CS00236930
CS00437680
CS00437681

CS00437682
CS00437684
CS00437687
CS00437691
CS00444978
CS00446031
CS00446035
CS00448843
CS00448845
CS00448949
CS00448951
CS00449590
CS00450468
CS00450471
CS00457484
CS00457490
CS00465053
CS00465392
CS00465393
CS00469075
CS00471345
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CS00521635
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